ENERGY MANAGEMENT SOFTWARE

POWERSTUDIO

(Standard, SCADA, Deluxe)

Version 4.0

USER MANUAL 3 / 4

(M98232001-03-13A)

DISCLAIMER

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www.circutor.com

CONTENTS

DISCLAIMER **3**

CONTENTS **4**

LOG OF REVISIONS **5**

1.- ACCESS VIA THE POWERSTUDIO CLIENT **6**

1.1.- WEB SERVER 6
1.2.- JAVA CLIENT 8
1.2.1. Status Bar *9*
1.2.2 Menu Bar *10*
1.2.3 Toolbar *12*
1.2.4 General client application options *13*
1.2.5 Displaying SCADA screens *16*
1.2.6 Displaying Reports *18*
1.2.7 Displaying device status *21*
1.2.8 Displaying a device *24*
1.2.9 Making graphs *35*
1.2.9.1 Zoom mode 39
1.2.9.2 Panning mode 42
1.2.9.3 Tooltip mode 44
1.2.9.4 Magnifying glass mode 45
1.2.9.5 Toolbar 46
1.2.9.6 Graph properties 48
1.2.9.7 Printing a graph 59
1.2.9.8 Export graph 59
1.2.9.9 Graph types 59
1.2.10 Making tables *64*
1.2.11 Displaying logged events *69*
1.2.12 Active and reported events *71*
1.2.13 Tasks *73*
1.2.14 Authentication *78*
1.3.- HTML5 CLIENT 80
1.3.1 Status bar *81*
1.3.2 Toolbar *82*
1.3.3 Dashboard *83*
1.3.3.1 Widget PSS Dashboard 84
1.3.3.2 Widget energy monitor 88
1.3.4 Displaying SCADA screens *91*
1.3.5 Displaying reports *92*
1.3.6 Making graphs *94*
1.3.6.1 Graph types 98
1.3.7 Making tables *100*
1.3.8 Displaying a device *101*
1.3.9 Displaying logged events *103*
1.3.10 Options *105*
1.3.11 Authentication *107*

2.- MAINTENANCE AND TECHNICAL SERVICE **108**

3.- GUARANTEE **108**

LOG OF REVISIONS

Date	Revision	Description
11/13	M98232001-03-13A	Original version

1.- ACCESS VIA THE POWERSTUDIO CLIENT

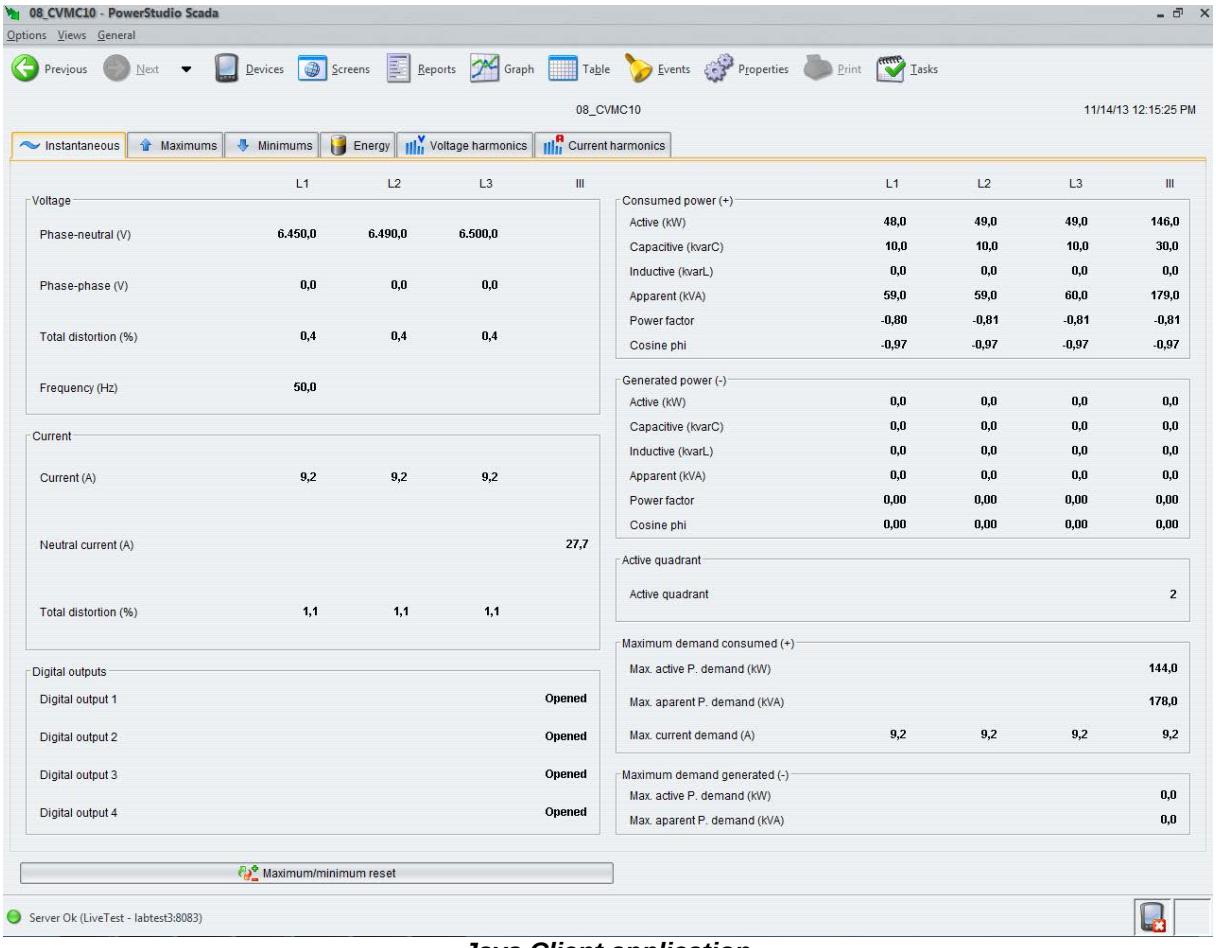
The software has a client application that will allow users to access SCADA screens, reports and to display instantaneous values being measured by devices either locally or through a remote connection. Graphs of the values recorded by the devices can also be prepared and listings accessed, events can be viewed, device status can be displayed, etc. Similarly, this client is available as an embedded applet on the application's webpage.

1.1.- WEB SERVER

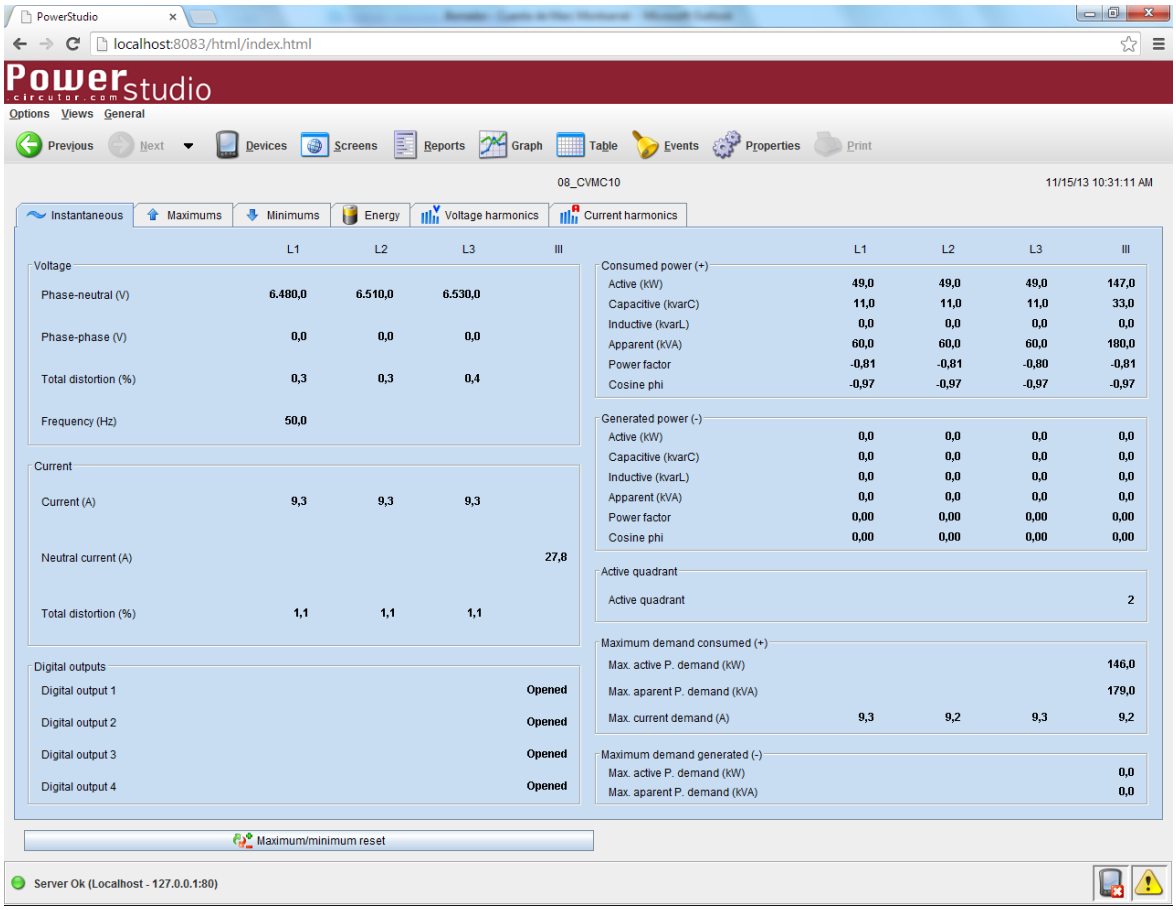
The communications engine acts as a Web server configured in port 80 by default. To properly configure the Web server review the 'User manual'.

If user authentication is enabled, all access restrictions to device value screens, SCADA screens, etc., will be applied to the remote user application trying to access them, either through the client provided, the embedded client application in the webpage such as a Java applet or the HTML5 client.

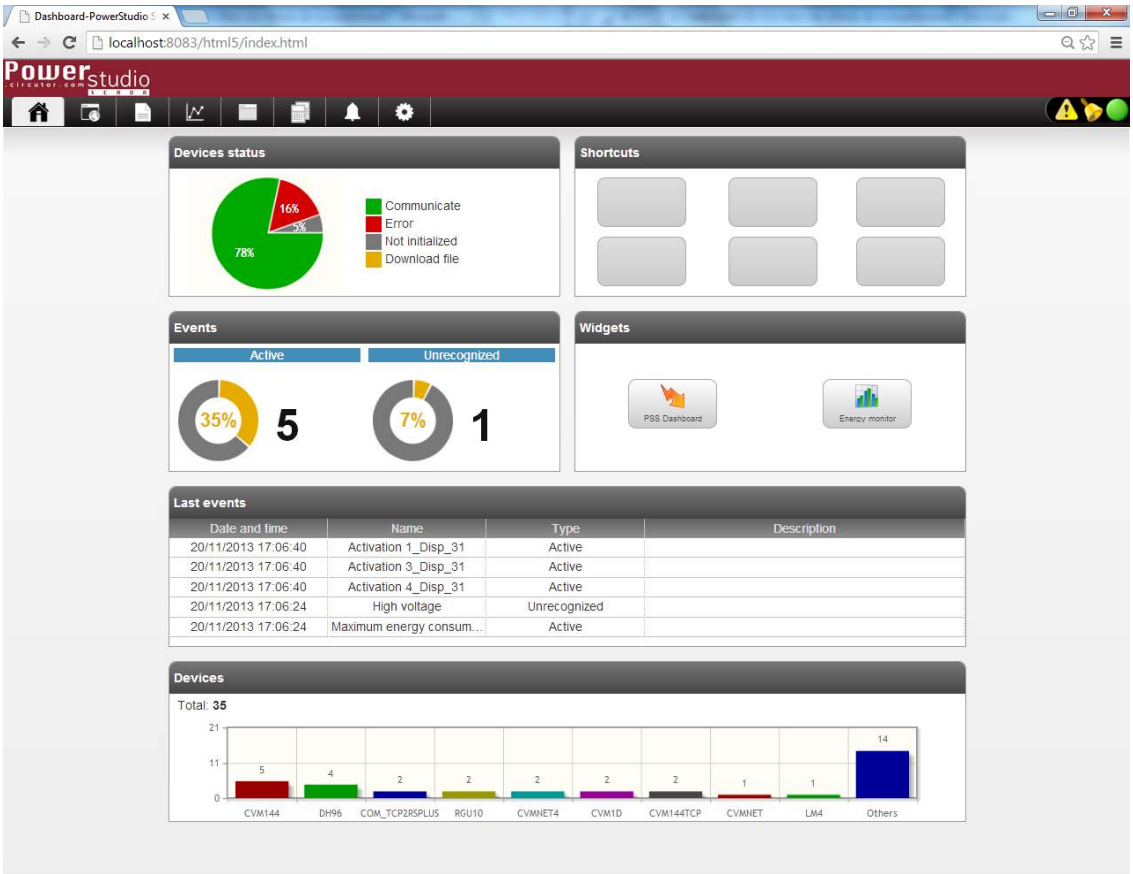
The appearance of the PowerStudio Client when run as a Java client application and as an embedded client in an applet in the application webpage and as a HTML5 client is shown below.


08_CVMC10 - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print Tasks
08_CVMC10
11/14/13 12:15:25 PM
Instantaneous Maximums Minimums Energy Voltage harmonics Current harmonics
Voltage
L1 L2 L3 III
Phase-neutral (V) 6.450,0 6.490,0 6.500,0
Phase-phase (V) 0,0 0,0 0,0
Total distortion (%) 0,4 0,4 0,4
Frequency (Hz) 50,0
Current
Current (A) 9,2 9,2 9,2
Neutral current (A) 27,7
Total distortion (%) 1,1 1,1 1,1
Digital outputs
Digital output 1 Opened
Digital output 2 Opened
Digital output 3 Opened
Digital output 4 Opened
Consumed power (+)
L1 L2 L3 III
Active (kW) 48,0 49,0 49,0 146,0
Capacitive (kvarC) 10,0 10,0 10,0 30,0
Inductive (kvarL) 0,0 0,0 0,0 0,0
Apparent (kVA) 59,0 59,0 60,0 179,0
Power factor -0,80 -0,81 -0,81 -0,81
Cosine phi -0,97 -0,97 -0,97 -0,97
Generated power (-)
Active (kW) 0,0 0,0 0,0 0,0
Capacitive (kvarC) 0,0 0,0 0,0 0,0
Inductive (kvarL) 0,0 0,0 0,0 0,0
Apparent (kVA) 0,0 0,0 0,0 0,0
Power factor 0,00 0,00 0,00 0,00
Cosine phi 0,00 0,00 0,00 0,00
Active quadrant
Active quadrant 2
Maximum demand consumed (+)
Max. active P. demand (kW) 144,0
Max. aparent P. demand (kVA) 178,0
Max. current demand (A) 9,2 9,2 9,2 9,2
Maximum demand generated (-)
Max. active P. demand (kW) 0,0
Max. aparent P. demand (kVA) 0,0
Maximum/minimum reset
Server Ok (LiveTest - labtest3:8083)

Java Client application


PowerStudio
localhost:8083/html/index.html
Powerstudio
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
08_CVMC10
11/15/13 10:31:11 AM
Instantaneous Maximums Minimums Energy Voltage harmonics Current harmonics
Voltage
Phase-neutral (V) 6.480,0 6.510,0 6.530,0
Phase-phase (V) 0,0 0,0 0,0
Total distortion (%) 0,3 0,3 0,4
Frequency (Hz) 50,0
Current
Current (A) 9,3 9,3 9,3
Neutral current (A) 27,8
Total distortion (%) 1,1 1,1 1,1
Digital outputs
Digital output 1 Opened
Digital output 2 Opened
Digital output 3 Opened
Digital output 4 Opened
Consumed power (+)
Active (kW) 49,0 49,0 49,0 147,0
Capacitive (kvarC) 11,0 11,0 11,0 33,0
Inductive (kvarL) 0,0 0,0 0,0 0,0
Apparent (kVA) 60,0 60,0 60,0 180,0
Power factor -0,81 -0,81 -0,80 -0,81
Cosine phi -0,97 -0,97 -0,97 -0,97
Generated power (-)
Active (kW) 0,0 0,0 0,0 0,0
Capacitive (kvarC) 0,0 0,0 0,0 0,0
Inductive (kvarL) 0,0 0,0 0,0 0,0
Apparent (kVA) 0,0 0,0 0,0 0,0
Power factor 0,00 0,00 0,00 0,00
Cosine phi 0,00 0,00 0,00 0,00
Active quadrant
Active quadrant 2
Maximum demand consumed (+)
Max. active P. demand (kW) 146,0
Max. aparent P. demand (kVA) 179,0
Max. current demand (A) 9,3 9,2 9,3 9,2
Maximum demand generated (-)
Max. active P. demand (kW) 0,0
Max. aparent P. demand (kVA) 0,0
Maximum/minimum reset
Server Ok (Localhost - 127.0.0.1:80)

Java Client application embedded as applet on the application web page



HTML5 Client

1.2.- JAVA CLIENT

The client is in charge of viewing all the information generated by the communications engine and the resource editor. The client is a platform independent program implemented in Java and ,therefore, can be executed in different ,as long as Java Virtual Machine version 1.6.0 or later is installed. Likewise, the client can be executed in Windows, Linux, Unix, Mac, OS/X, and other environments.

The Java client can be run both as a local application (AppletScada.jar) in the form of an embedded applet on a downloadable webpage directly from the address where the engine is installed. In this last case browsers such as Internet Explorer (version 6.0 or higher), Mozilla Firefox (version 1.5 or higher), Opera (version 9 or higher) and Netscape Browser (version 8 or higher) can be used. Nevertheless, the client application may work on other browsers or on older versions of the officially supported browsers.

The client application is designed with a philosophy similar to that of a web browser. This means that the program manages a series of views (or web pages on a browser), maintaining them on a list and enabling access to them in different ways.

Java client application with a SCADA screen as an active view

As shown in the previous image, the client mainly consists of four separate areas, the uppermost menu bar, the toolbar directly below it, the active view, the center and the status bar, on the lower part. The name of the view being shown at that moment appears on the title of the window.

The menu bar contains all the client's available options, view browsing, direct access to these, general options, etc. The toolbar has quick and direct access to the most important options at any time. The current view displays the resource active at the time, a SCADA screen, a report, device status, etc. The status bar contains general information relating to the application, showing server communications status, equipment communications status, active events, etc.

1.2.1. Status Bar

The client status bar contains general and relevant information about the application, such as server communications status.

Status bar communicating correctly with the server

If the client application has established a connection with the engine, on the left side of the bar you'll see a green indicator and a text stating that the server is active and communicating correctly through the address and port given. If the client cannot establish a server connection this will also be indicated.

Status bar not communicating with the server

Inability to establish a connection may be due to the following:

- *Incorrect IP address or port:* Incorrect server IP address or port; make sure engine IP address and port are correct.
- *Engine not running*: Make sure the server the engine is running on the machine the client application is trying to connect to.
- *Engine is not enabled as a web server:* Make sure that the engine has managed to boot the web server at the specified port.

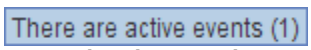
Clicking on the corresponding icon on the right side of the status bar will also report communications status with devices defined in the program, indicating whether there is any impact on communications with any device in the box on the left.

Status bar communicating with the server but with errors in communication with the devices and active events

Communication incidences are transmitted by two icons:

- **Error in communications:** There has been some kind of error in communications, either because of a device or a connection. This icon encompasses several individual incidences, as detailed in *"Device status."*
- **Devices not initialized**: There are unknown devices with which it has not yet been possible to establish communication.

Similarly the icon corresponding to the square on the right reports active events in the application. Floating the cursor over this icon will cause a message to appear indicating the number of currently active events.



Message showing 6 active events

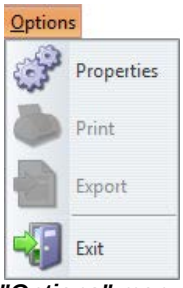
Double-click the icon in question to see details of device communication problems and active events. First go to the device status view and the active events window will appear. Both device status view and the active events window will be discussed later in more detail.

N.B: The status bar can be hidden using the "*General*" option in the client application menu. It may also be hidden using the "*Enable statusbar*" option in editor "*Preferences*". In the latter case it will not be possible to make it appear again from the client application.

1.2.2 Menu Bar

The menu bar, located at the top, provides access to all available client features. There are three main menus, "*Options*", "*Views*" and "*General*".

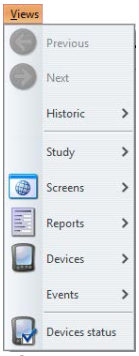
The "*Options*" menu consists of the following sections:



"Options" menu

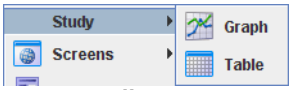
- **Properties:** Displays properties of the currently active view. This option can be active or not depending on the view in progress.
- **Print:** Print currently active view. This option can be active or not depending on the view in progress.
- **Export:** Exports currently active view. This option can be active or not depending on the view in progress.
- **Exit:** Exit the client. This option is not available when the client is embedded in the application website.

The "*Views*" menu consists of the following sections:



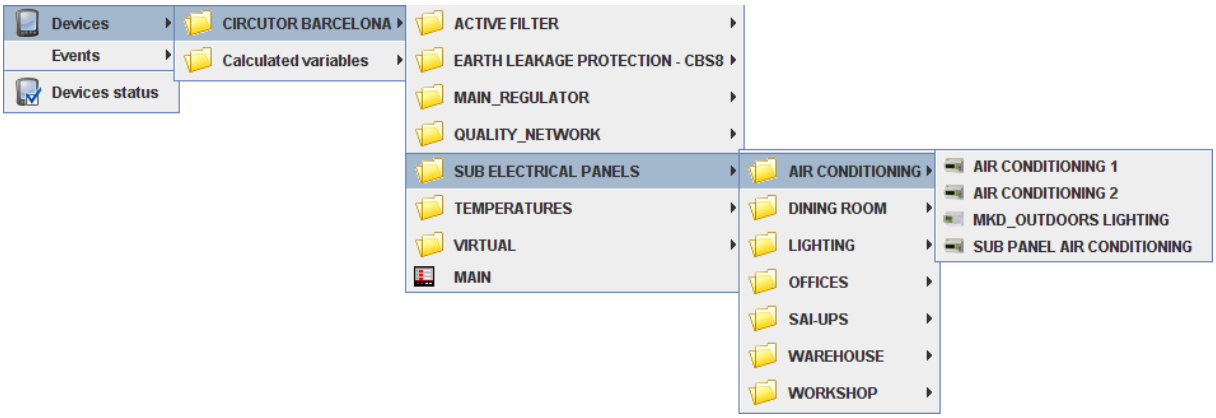
"Views" Menu

- **Back:** Displays the previous view.
- **Next:** Displays the next view.
- **Data log:** Displays any logged view.
- **Studio:** Displays graph and tables views.



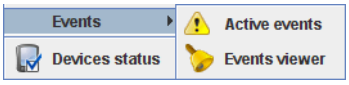
"Studio" Menu

- **Screens:** Displays one of the user-defined SCADA screens.
- **Reports:** Displays one of the user-defined reports.
- **Devices:** Displays the monitoring view of a particular device using the device tree.



"Devices" Menu

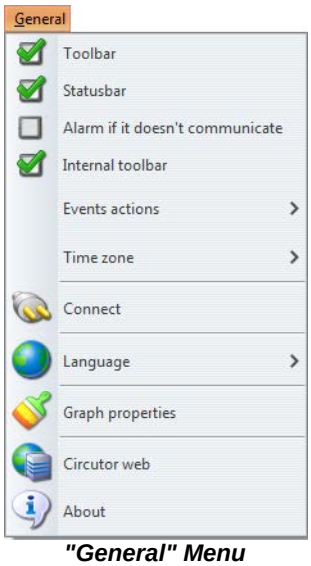
- **Events:** Displays the events log or the active events window.



Events Menu

- **Status of devices:** Displays device status view.

Finally, the "*General*" menu comprises the following options:



"General" Menu

- **Toolbar:** Displays or hides the toolbar.
- **Status bar:** Displays or hides the status bar.
- **No communication alarm:** Allows you to set whether or not an alarm should sound when there is no server.
- **Internal toolbar:** Displays or hides the internal toolbar.
- **Events actions:** Allows choice of which types of actions associated with the events we would like to run on the client and which not.
- **Time zone**: Allows you to change the client's time zone. The engine's time zone will be selected by default.
- **Connect:** Connects with another server changing the IP address and / or the port.
- **Logout**: Closes the current session. Only available when the user has connected to a server that requires authentication.
- **Language:** Changes the client application language.
- **Graph properties:** Allows you to change the properties, such as the background colour, axes or default graphic group.

- **Circutor Website:** Shortcut to Circutor web site.
- **About:** Displays client application information.

N.B: The menu bar may be hidden using the "*Enable menu*" option in the editor "*Preferences*". In this case it will not be possible to make it appear again from the client application itself.

1.2.3 Toolbar

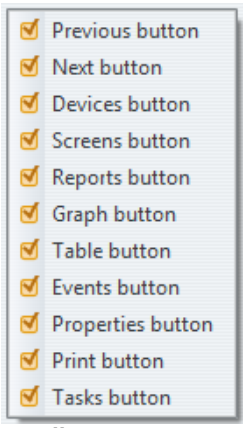
The toolbar allows the user more direct access to the most important options at all times.

Toolbar

The following options are available:

- **Back:** Displays the previous view.
- **Next:** Displays the next view.
- **Down Arrow:** Displays any logged view.
- **Devices:** Displays the monitoring view of a particular device using the device tree.
- **Screens:** Displays one of the user-defined SCADA screens.
- **Reports:** Displays one of the user-defined reports.
- **Graph:** Creates a graph.
- **Table:** Creates a table.
- **Events:** Displays event history.
- **Properties:** Displays the properties window of the current view.
- **Print:** Allows us to print the current view.
- **Tasks**: Allows you to define the tasks that will be sent via email or to save reports with a specific frequency.

Use the context menu of the button bar to hide or display buttons. Right click the toolbar button to access this.



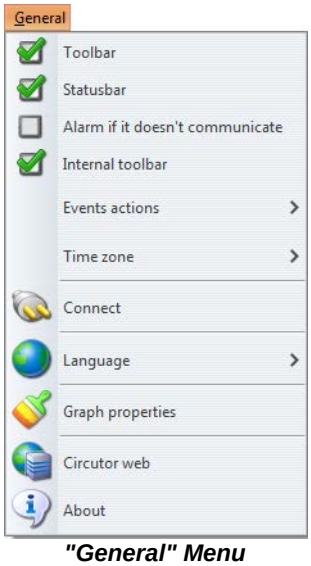
Toolbar setup menu

On this menu we can define which buttons we want to show and hide.

N.B: The toolbar may be hidden using the "*General*" menu. The menu bar may be hidden using the "*Enable toolbar*" option in the editor "*Preferences*". Using this latter method it will not be possible to make it appear again from the client application.

1.2.4 General client application options

The client application has some general options that allow enhanced customization, as well as the configuration of some general aspects. These functions are accessed using the "*General*" menu of the application.



"General" Menu

As previously discussed, the "*Toolbar*", "*Status Bar*" and “Internal toolbar” options permit their respective bars to be shown or hidden.

The "*No communication alarm*" option indicates whether or not the client application should make an audible alarm sound when the engine is not communicating. Typically, the audible alarm consists of a series of consecutive beeps that sound while attempts to connect to the engine are unsuccessful.

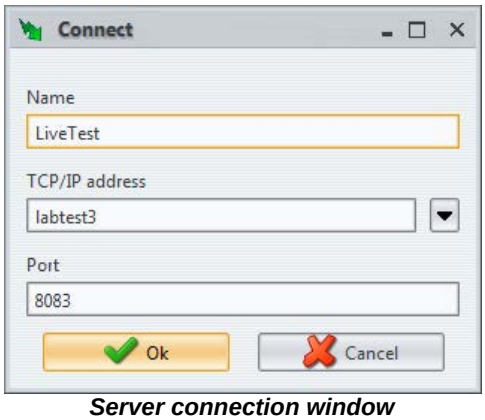
The "*Events actions*” option allows enabling, disabling or notification of client events. You may enable or disable view changes, sound messages or execution of external applications.

Event actions menu

The *“Time zone”* option allows changing the client’s time. It’s possible that the user may view engine data from a PC that is in a different time zone from that of the engine. By default, the data is shown referenced to the time zone where the client application is running (local), but this configuration may be changed to show the data referenced to the time zone that you choose.

Time zone selection

The "*Connect*" option directs the client application to connect with the desired server. Clicking on this option will cause the following window to appear:

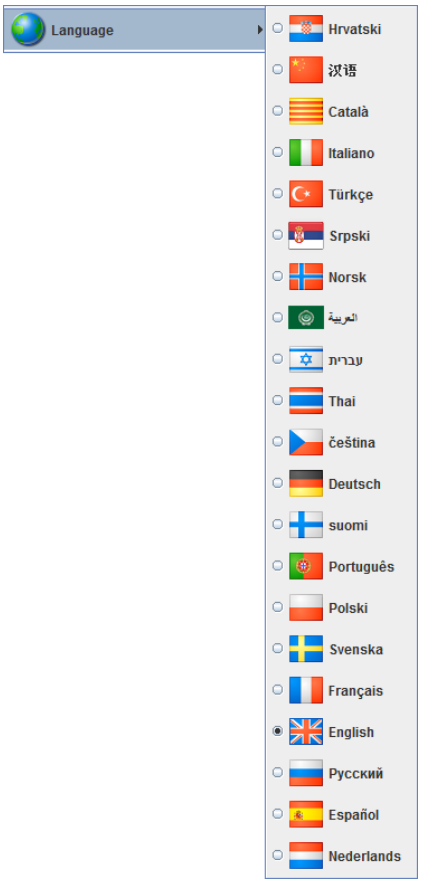


Server connection window

The server IP address and port can be indicated here. The IP address can be numerical, as in the example above (XXX.XXX.XXX.XXX) or the web address directly (www.myaddress.com). Upon clicking accept the client application verifies the data entered is syntactically correct and tries to connect to the server using the specified address. The previous connection will be lost because the client may only connect to one server at a time. This option is not available when the client application is embedded as an Applet in the application website, because only connections with the machine from which it is downloaded are permitted.

The "*Logout*" option quits the current session. This option appears only if the authentication on the engine is enabled and the user correctly enters the required user name and password at some point.

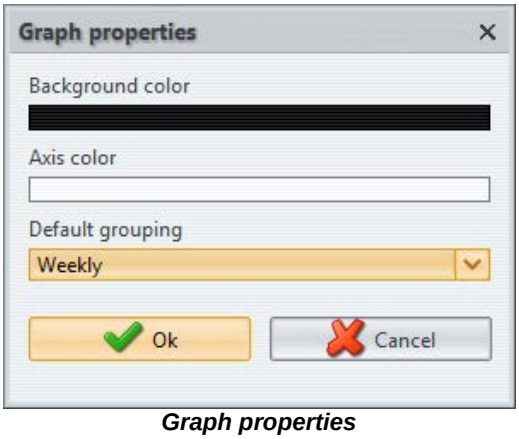
The "*Language*" option permits client language changes.



"Language" Menu

The available languages are provided by the engine. Upon executing the client application and connecting to the engine, the list of available languages and texts relating to the local language of the machine the client is running are requested. If the server does not have the client language it will request the texts relative to the language in which the server is configured.

The *"Graphic properties"* option allows you to change the background colour, axes or default graphic group created with the Java client.



Graph properties

The *"Circutor Web Site"* option allows you to access the web site directly with the default browser.

The "*About*" option provides general information about the client, such as version, manufacturer, etc.

1.2.5 Displaying SCADA screens[1]

One of the most important features of the client is its ability to display SCADA screens defined and designed in the editor, both local and remote. You can display any SCADA screen defined using the "*Overviews*" menu option and then "*Screens*" or directly from the "*Screens*" button on the toolbar. However, when the client application connects to a server, the client will automatically show the initial screen defined by the user on the server or if this is not specified, the first SCADA screen from the list of defined screens.

SCADA screens basically consist of a background image (which may or may not exist and is therefore white) and a series of controls placed on it. The information provided by a SCADA screen is updated on an ongoing basis. It acts on the basis of two main types of controls, those displaying some kind of data and those which require or allow user intervention.

The display controls simply show information on the screen. There are various types of information which may or may not vary over time depending on the type of control. For example, a formula varies over time depending on the values of the variables that make it up, and conversely a static image is always fixed. Display controls are:

- Text control
- Image control
- Date control
- Formula control
- Filler control
- Conditioned control
- Flood fill control
- Dynamic image control
- Analogue bar control
- Embedded graphic control
- Primitive control

For scope and detailed operation of these controls see the SCADA screens editing manual section.

Click on the action controls to use them. When on a control action since the cursor will change to a hand with the index finger extended, rather than the typical arrow.

The typical action control lets you change your SCADA screen and provides a simple and intuitive way to navigate through the designed application. Action controls are:

- Screen control
- Report control
- Device control
- Graph / table Control
- Active events control
- Event view control
- Execution Control
- Forcing variables control

For scope and detailed operation of these controls see the SCADA screens editing manual section.

All SCADA features are shown on the screen and are fully dependent on the design used when defining the controls.

[1] Only in SCADA and Deluxe versions

The “Internal Toolbar” is displayed on the screen by selecting the zoom option. This option can be selected by the user from the sliding bar or drop-down menu with the automatic adjustments options.

1.2.6 Displaying Reports[2]

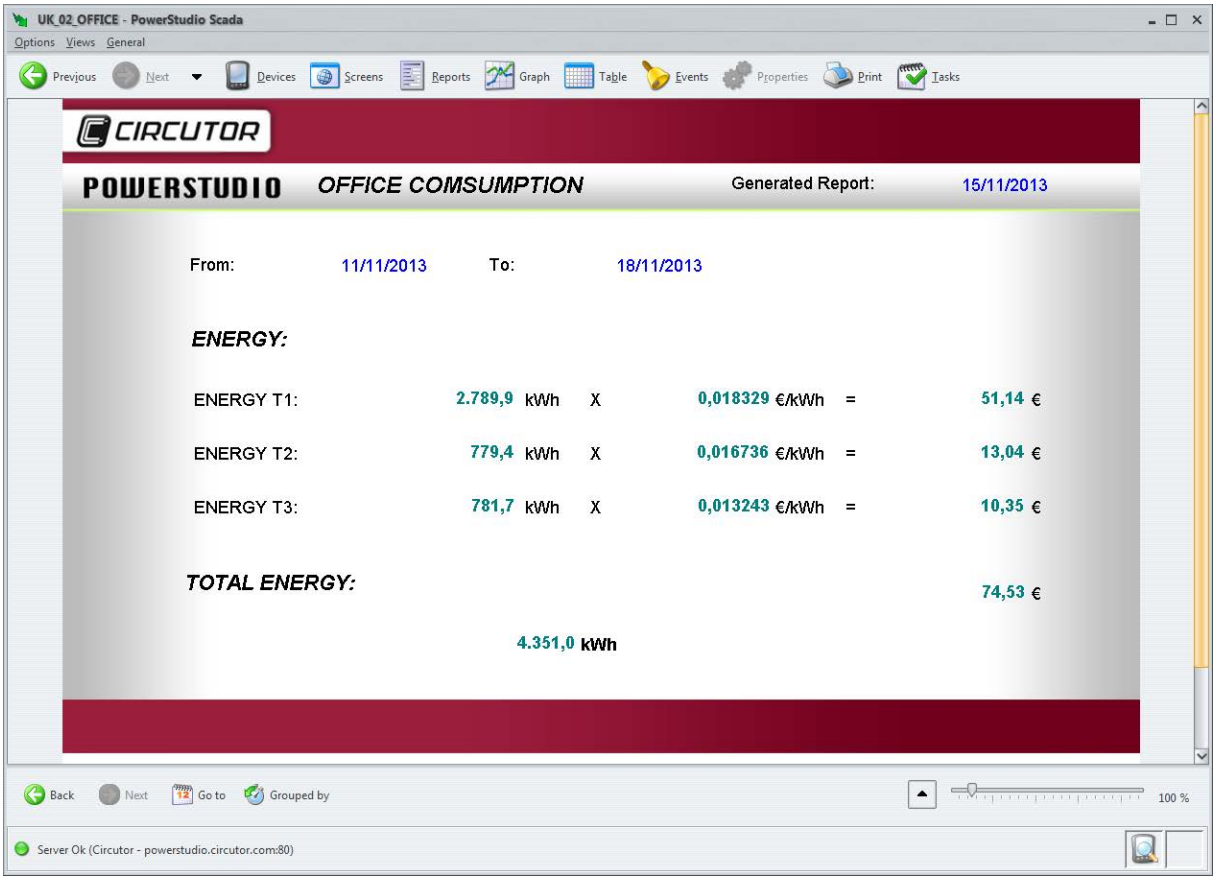
Another of the prominent client application features the ability to see reports defined and designed in the editor both locally and remotely. You can display any defined report defined "*Views*" menu option and then "*Reports*" or directly from the "*Report*" button on the toolbar. You may also access a particular report from a SCADA screen where a control report has been added, which will point directly to the report defined.

The reports consist essentially of a series of pages and each page consists of a background image (which may not exist and hence be white) and a series of controls placed on it. The controls available in a report are as follows:

- Text control
- Image control
- Date control
- Formula control
- Conditioned control
- Graph control
- Analogue bar control
- Embedded graphic control
- Primitive control

For scope and detailed operation of these controls see the reports section in the edition manual.

The information provided by a report is always related to a period of time and will only be updated in response to changes in this period by the user via the lower toolbar.


UK_02_OFFICE - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print Tasks
CIRCUTOR
POWERSTUDIO
OFFICE COMSUMPTION
Generated Report: 15/11/2013
From: 11/11/2013 To: 18/11/2013
ENERGY:
ENERGY T1: 2.789,9 kWh X 0,018329 €/kWh = 51,14 €
ENERGY T2: 779,4 kWh X 0,016736 €/kWh = 13,04 €
ENERGY T3: 781,7 kWh X 0,013243 €/kWh = 10,35 €
TOTAL ENERGY:
74,53 €
4.351,0 kWh
Back Next Go to Grouped by
100 %
Server Ok (Circutor - powerstudio.circutor.com:80)

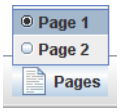
Report View

[2] Only in SCADA and Deluxe versions

Unlike a SCADA screen, in a report there are no active controls that react to user actions, so that interaction with the report reduces the options available in the menus or toolbars, especially the lower toolbar, which is typical of this type of view.

Reports toolbar

From the toolbar the desired page of the report can be displayed using the "*Pages*" buttons. This option does not appear if the report consists of a single page.

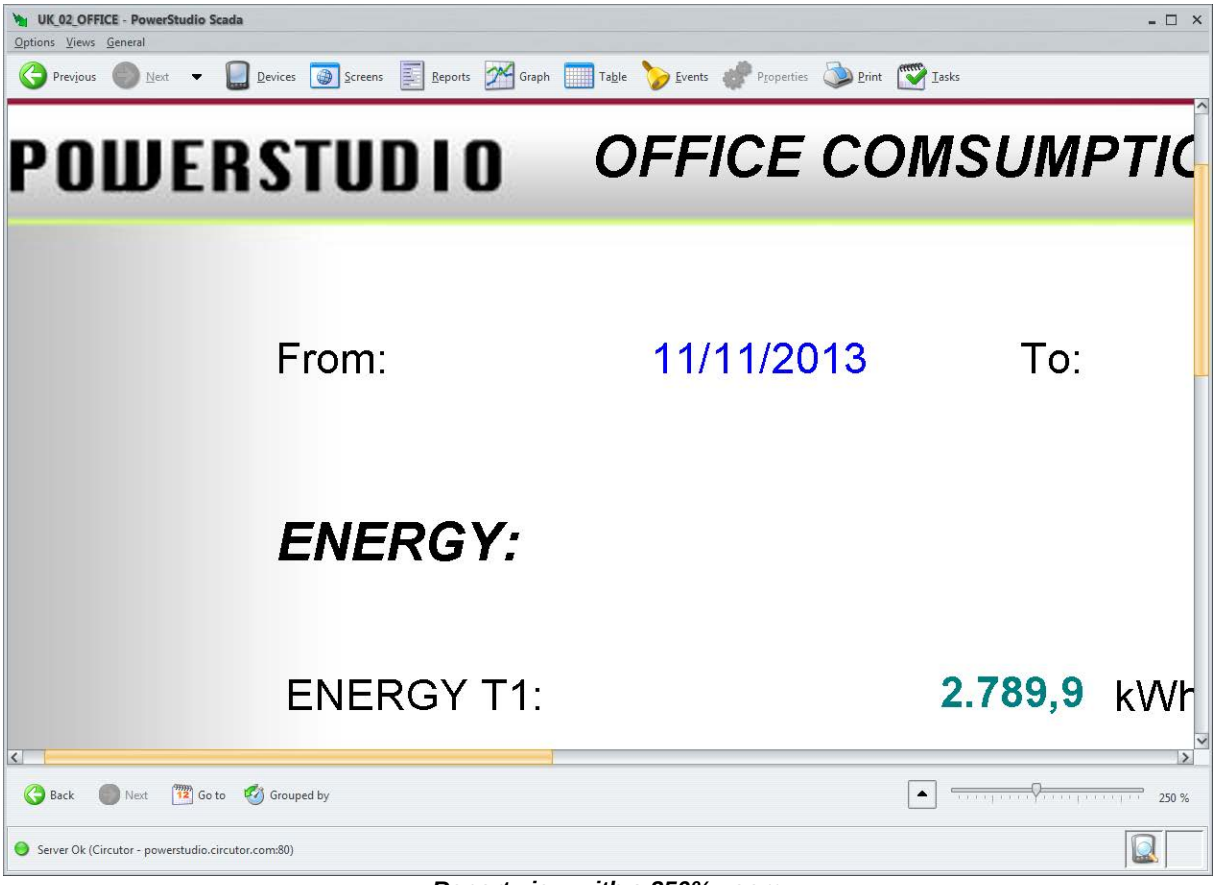


"Pages" Menu

Each page of the report can be expanded or reduced by the "*Zoom*" option on the bottom toolbar.

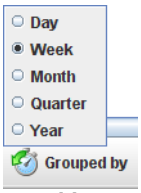
"Zoom" Menu

The "*Adjust*" option makes the current page fit completely into the active view maintaining the ratio aspect. Choosing an option that causes the page not to fit into the view will cause scrollbars to appear enabling page navigation.



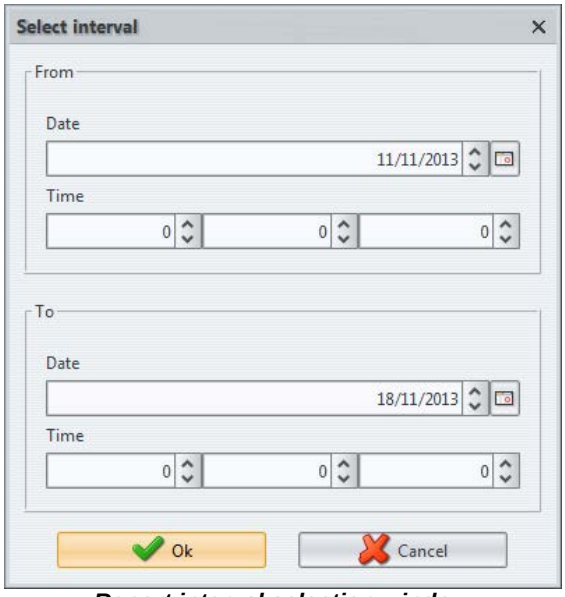
Report view with a 250% zoom

The user can change the grouping period the report refers to at any time. This is done using the "*Grouped by*" option on the toolbar.



"Grouped by" option

As can be seen, the application provides quick access to daily, weekly, monthly, quarterly and annual reports. To display a report of a period not included in any of those pre-defined, select the "*Go*" option on the toolbar.



Report interval selection window

Use this window to exactly specify the report period. For example, to make a report of the first 5 days of a month, or the first 6 hours of a day, and so on.

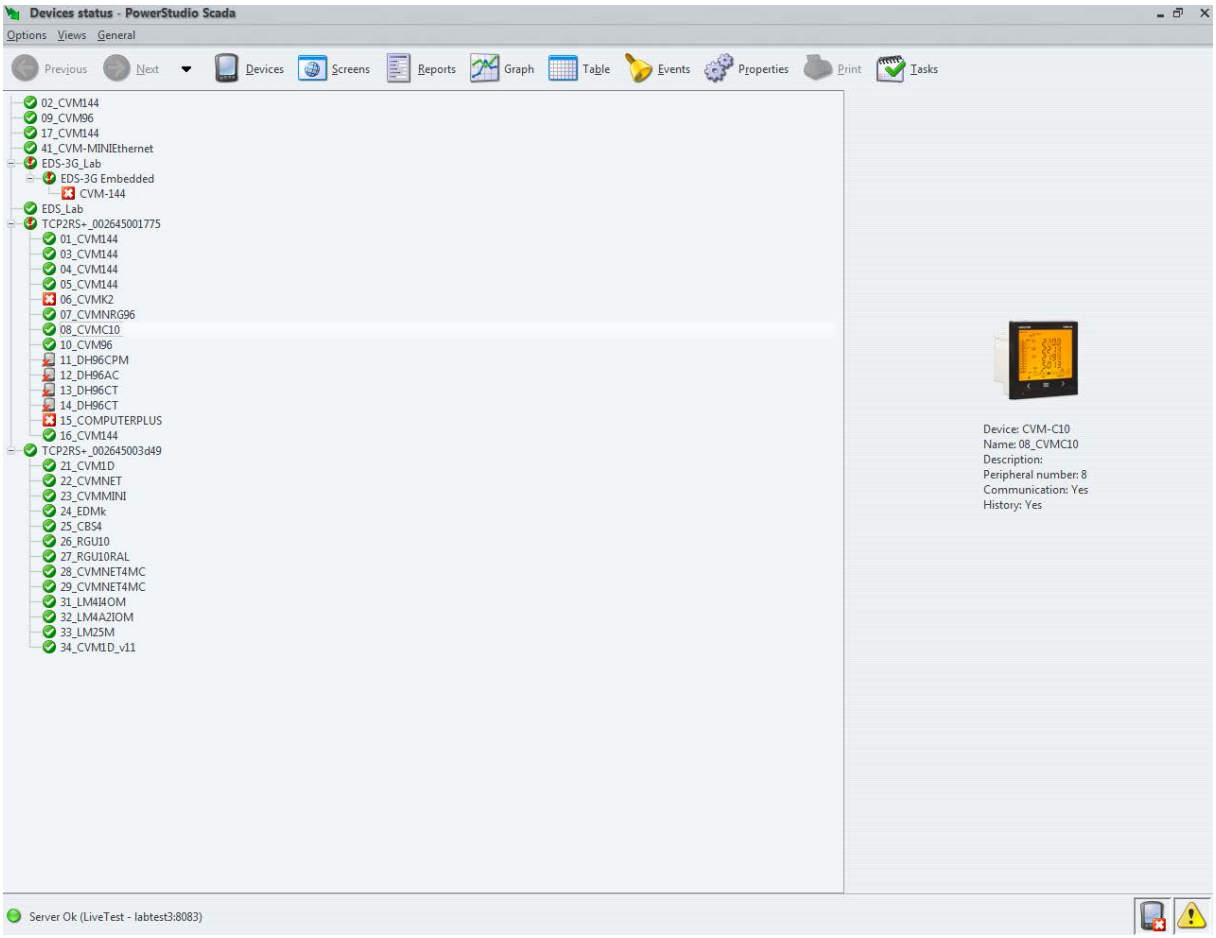
Irrespective of the period over which the report is made, the user can scroll to the previous period or next (if any), using the "*Back*" and "*Next*" buttons in the toolbar below. Thus, if grouped by day, the "*Back*" button displays the previous day; if grouped by week, the "*Next*" button displays the following week.

The user can print the current page of the report at any time using “*Print*” in the “*Options*” menu of the main menu or the "*Print*" button of the upper toolbar. Note that this option, unlike the SCADA screens, is enabled for reports.

1.2.7 Displaying device status

Local and remote device communications status may be checked using the client application. To view device status use the "*Views*" menu option and then "*Device status*". It is also possible to access this view using the status bar by clicking on the icon that indicates that there are errors in communications, only when there are incidents.

This view consists of a tree which details the status of all the devices connected to the engine. The default representation of this tree is a series of father nodes that represent the equipment connected directly to the PC where the search engine is running, from which a series of sons nodes representing the equipment connected to the device are rooted.



View device status by connection

Each node has an icon representing the communication status of the equipment. The following statuses are possible:

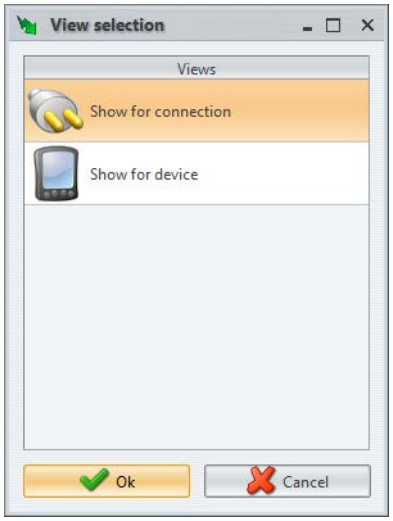
- **OK:** Equipment communicating properly.
- **Device downloading:** Currently downloading device data.
- **Connection error:** The connection where the device can be found presents problems.
- **Device not started up:** Currently attempting to establish initial communication with the equipment. This process is necessary initially to ascertain the configuration of the equipment.
- **Failed communications:** Unable to establish communication with the equipment; response time exceeded.
- **Incorrect version:** Equipment communicates correctly but it is a version the program does not support. It may be an old version.

- **Phase error:** Equipment communicates correctly but some phase connection is incorrect.
- **Channel error:** Unable to open the communication port. This action must be carried out to establish communication with the device.
- **Failed communications:** Some of the devices connected to this equipment do not communicate properly.
- **Camera transmitting images:** The engine is receiving images from the camera as a customer application is requesting them.
- **Camera paused:** The engine is not receiving images from the camera as they are not being required by any client application.
- **Error on the memory card.** The SD Memory Card is invalid, write-protected or not present.

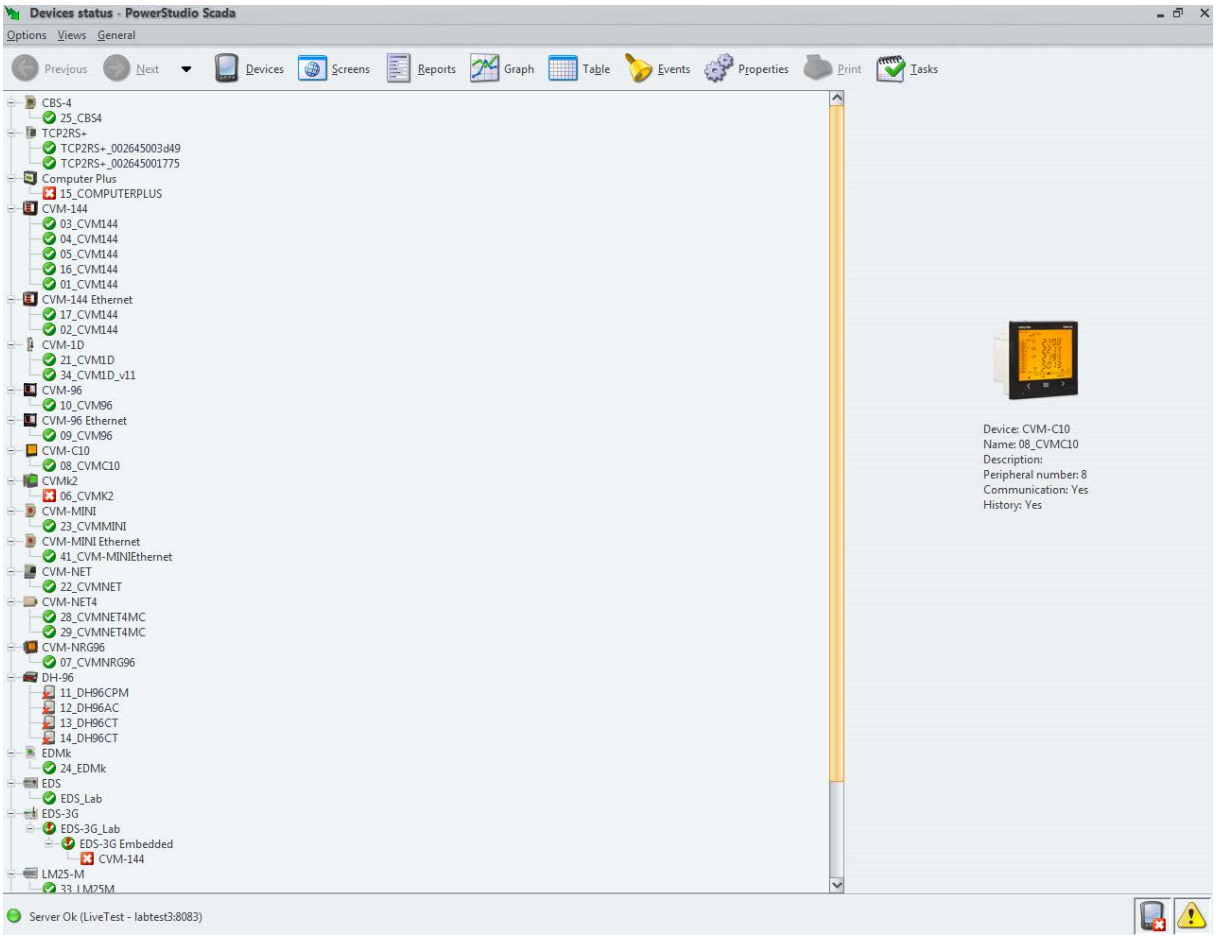
When selecting a device from this tree (any node), we can see its characteristics on the right hand panel. Typically these features are an image of the device itself, device type, name, description and device number.

Right click to quickly display the entire tree. Clicking the middle mouse button (or scroll wheel) will also quickly display the entire tree.

The device status tree can be organized in two ways, by connection or by device type. To change its icon, access the "*Properties*" option from the toolbar or the equivalent option in the "*Options*" menu, which will bring up the following dialogue:



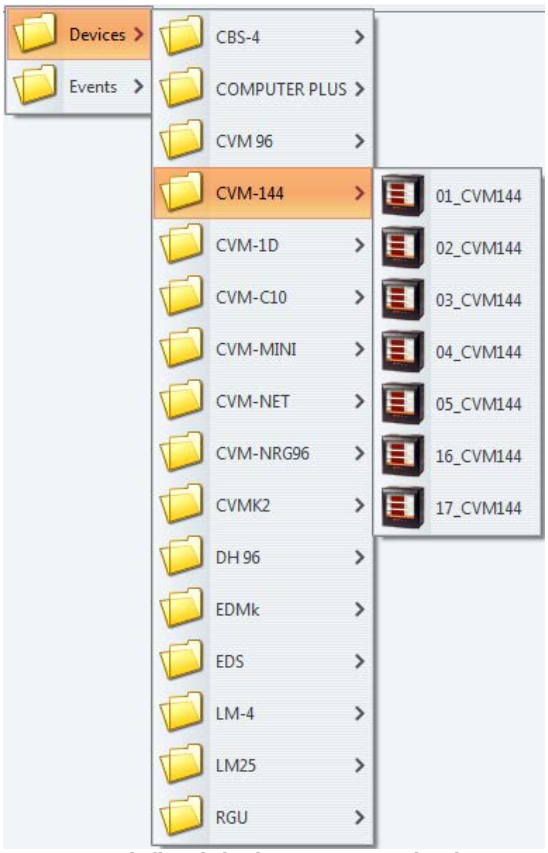
Device status tree organization selection



Device status organized by device type

1.2.8 Displaying a device

The client application can display all devices in real time. Thus, each device provides one or more overviews that allow its status and values to be displayed in real time. Display this view using the "*Views*" menu option and then "*Devices*" or directly from the "*Devices*" button on the toolbar. In both cases the user must search the tree for the required device.



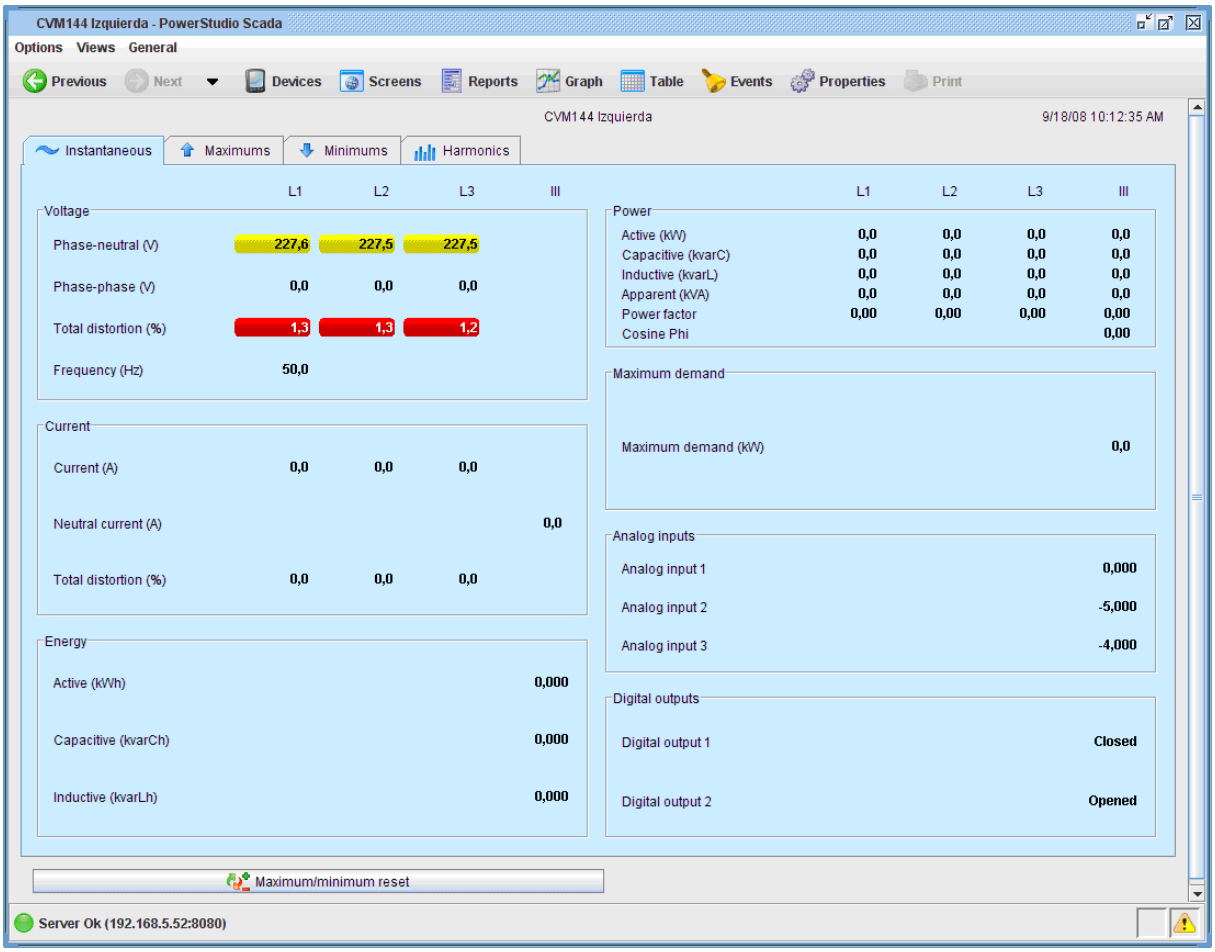
User defined device tree organization

You can also access the display screen of a particular device from a SCADA screen where a control device has been added.

A device display screen can have multiple appearances. Devices mainly define two types of screens, one analogue and one text (numeric). The analogue view display most of the values in maximum, minimum and present bars, while the current text view displays them in text form and organized in different ways, usually in tabs.

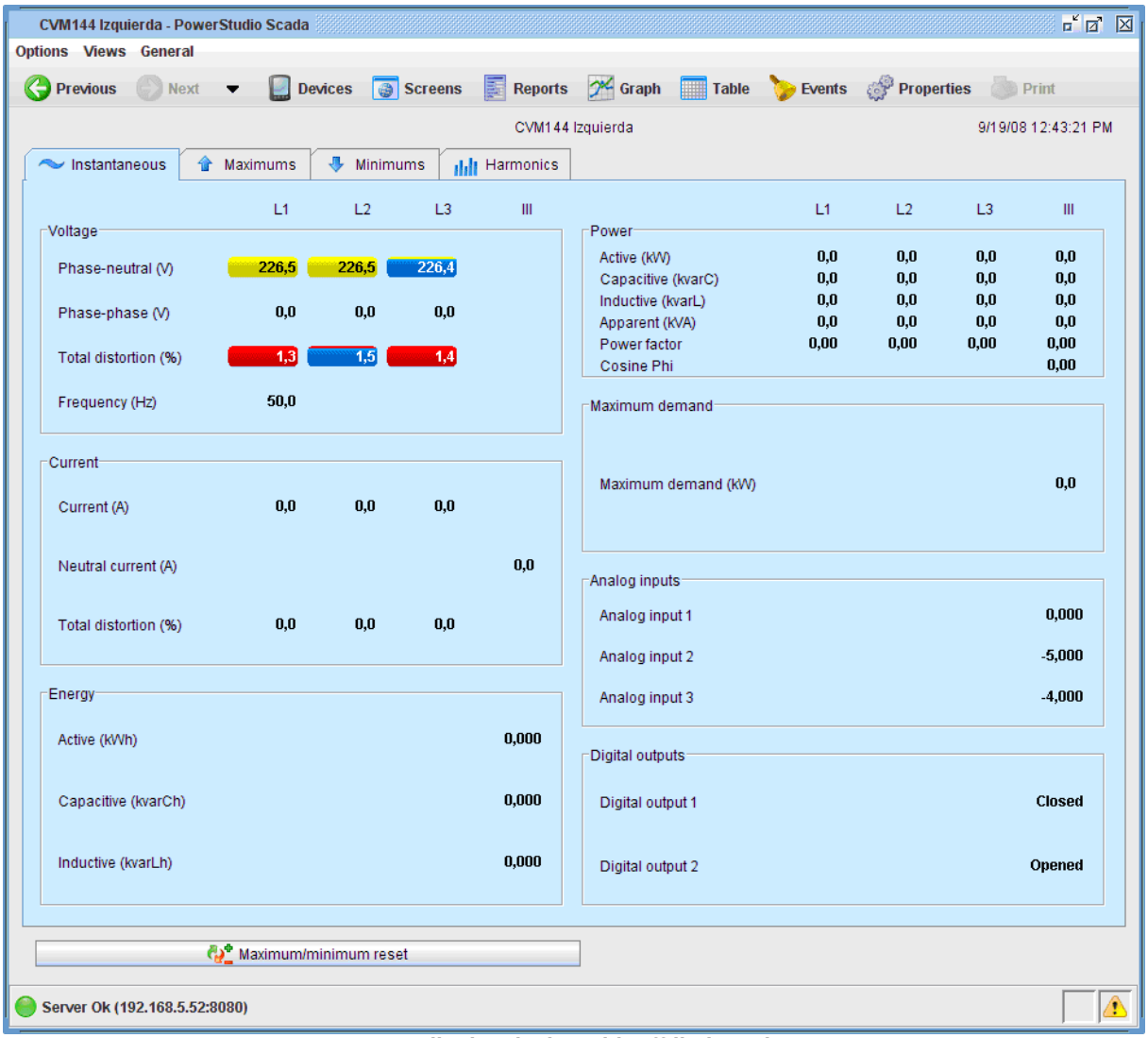
A common element on all the display screens is that there are numerical values for the variables which refresh in real time and can be selected to be used when making graphs or historical graphs (trends).

Another common element is that on most displays there is an upper bar specifying the device status, and the name and date on which the values displayed were read.



Device display screen (text view)

As can be seen on the previous screen, the various variable values are organized in tabs, graphs, tables, rows and/or columns for easier location. Likewise, some of the selected variables can be seen marked by white letters on a blue background. Another common element among the various device overviews is that limits can be set on the variables values, so that they can be marked with one color or another depending on the interval.



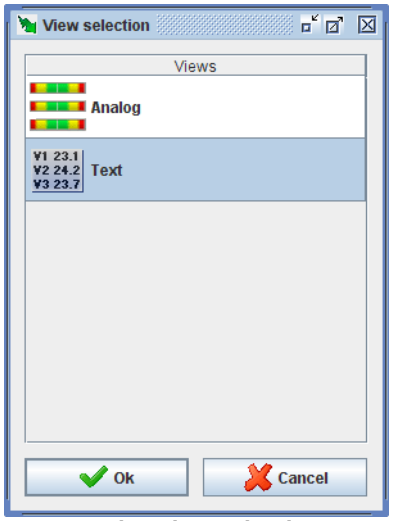
Screen display device with off-limits values

As can be seen in the previous screen there are values which exceed the defined limits. Similarly, how some variables are selected is also shown (blue background with white letters).

The analogue view provides approximately the same information but in a more graphic way, so that defined limits may be displayed as a bar graph.

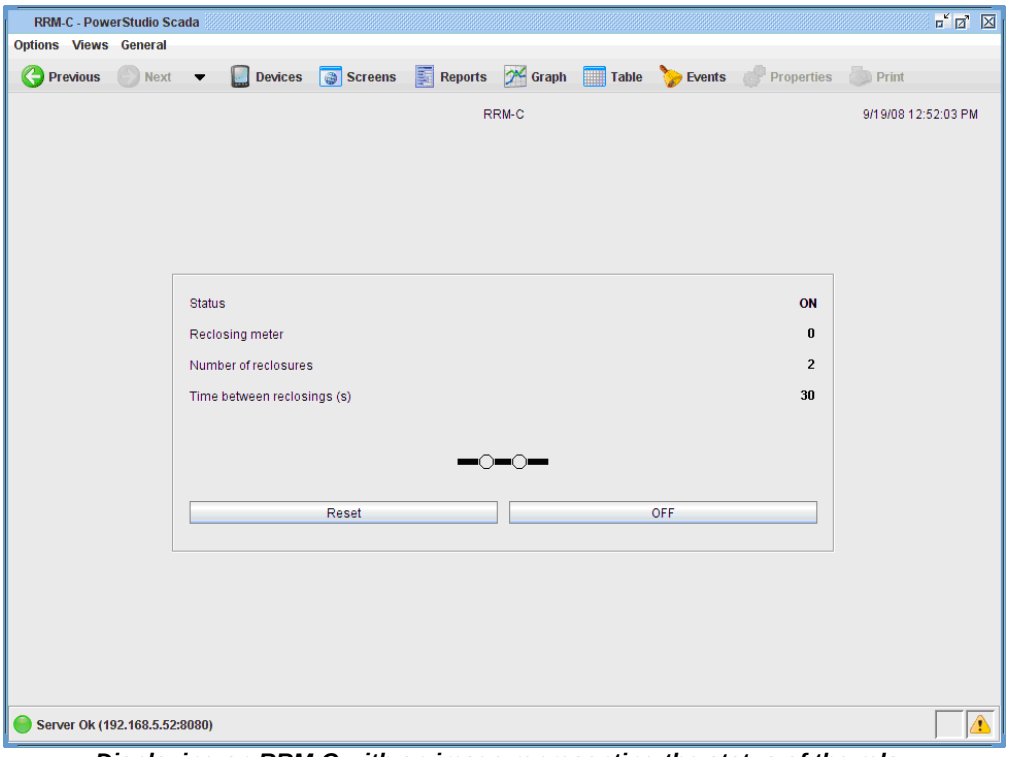
Device view. Analogue Representation

Devices providing more than one representation (typically two) can be exchanged with each other by selecting "*Properties*". This option can be accessed from the "*Options*" menu or from the "*Properties*" button on the toolbar. This option will be disabled for those devices that only have one possible view.

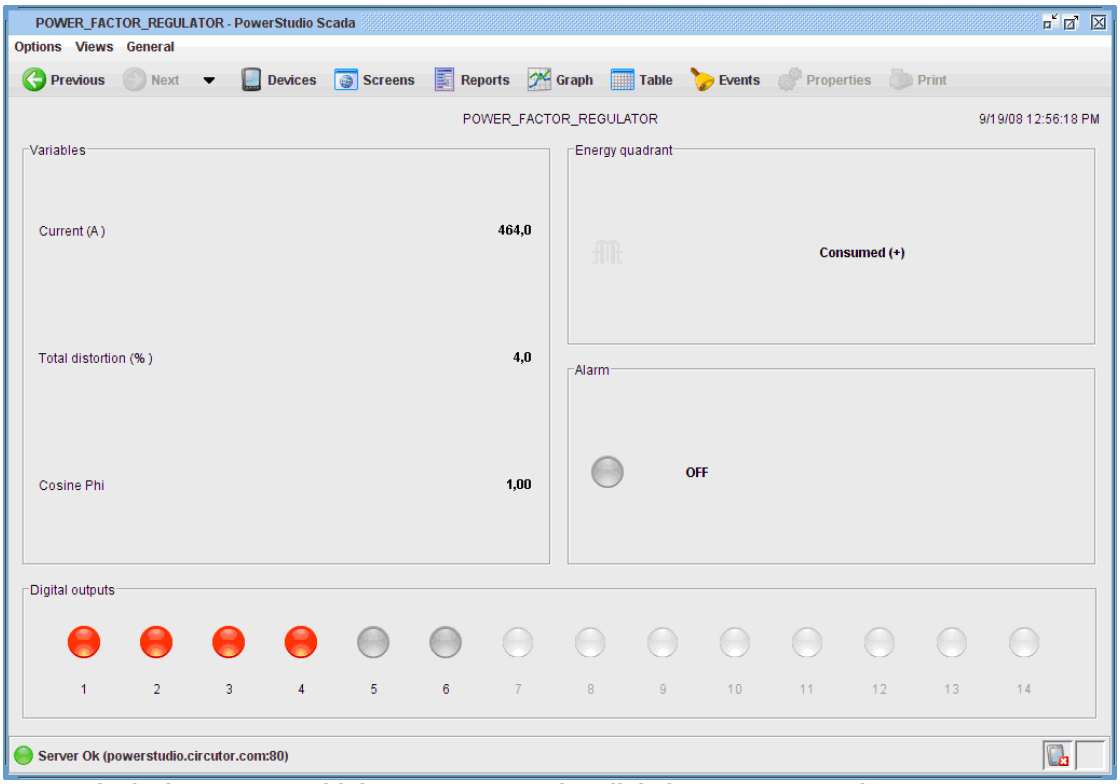


Device view selection

Device information can be displayed in numerical values or bars organized into tabs, boxes, rows and / or columns, as well as forms, depending on the type of device in question. A typical way to represent the information would be graphically through descriptive images of the status of a variable or set of variables.

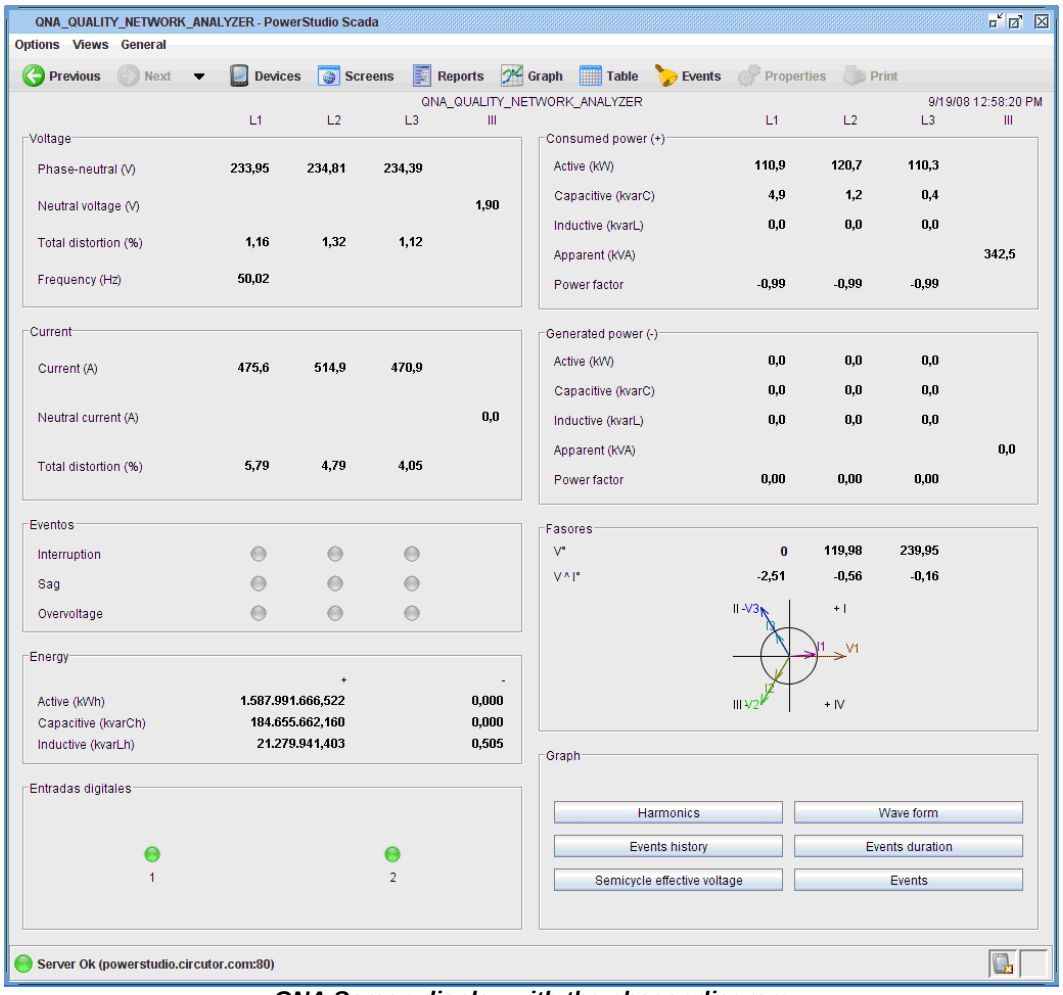


Displaying an RRM-C with an image representing the status of the relay



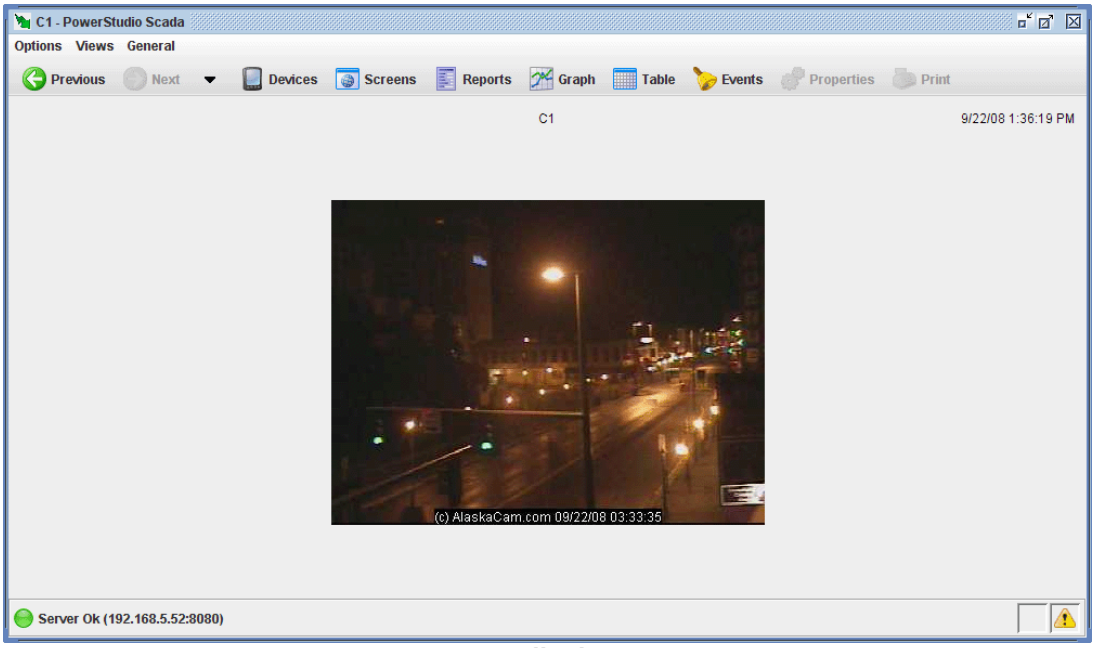
Displaying a C-14D with images representing digital output status, alarm status, etc.

Other more specific ways to represent the information can also be found, such as the QNA phasor diagram.



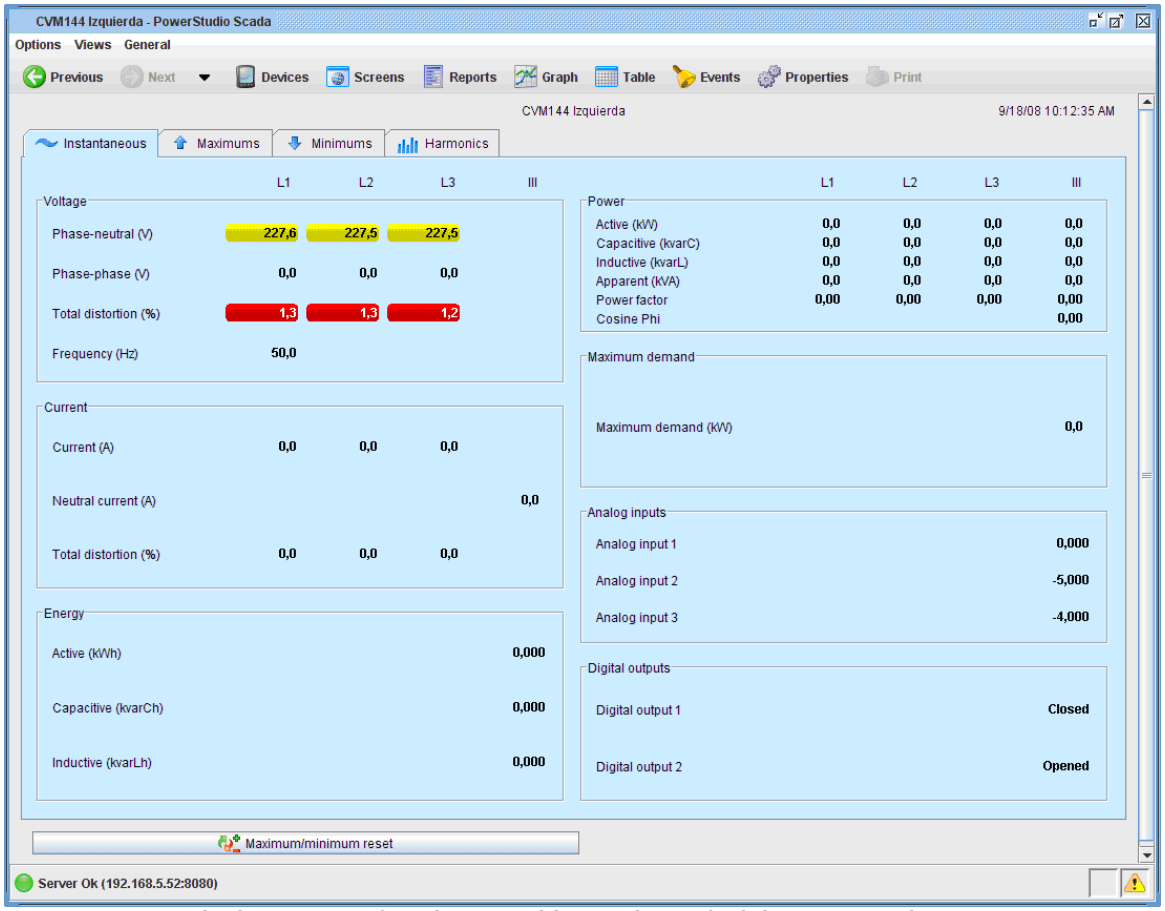
QNA Screen display with the phasor diagram

Another noteworthy device display screen is that which corresponds to the IP camera. This screen displays the camera image which is updating in real time (speed of updating depends as much on camera settings as the configuration for refreshing when adding this device, as well as the speed of the TCP / IP network)


C1 - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
C1
9/22/08 1:36:19 PM
(c) AlaskaCam.com 09/22/08 03:33:35
Server Ok (192.168.5.52:8080)

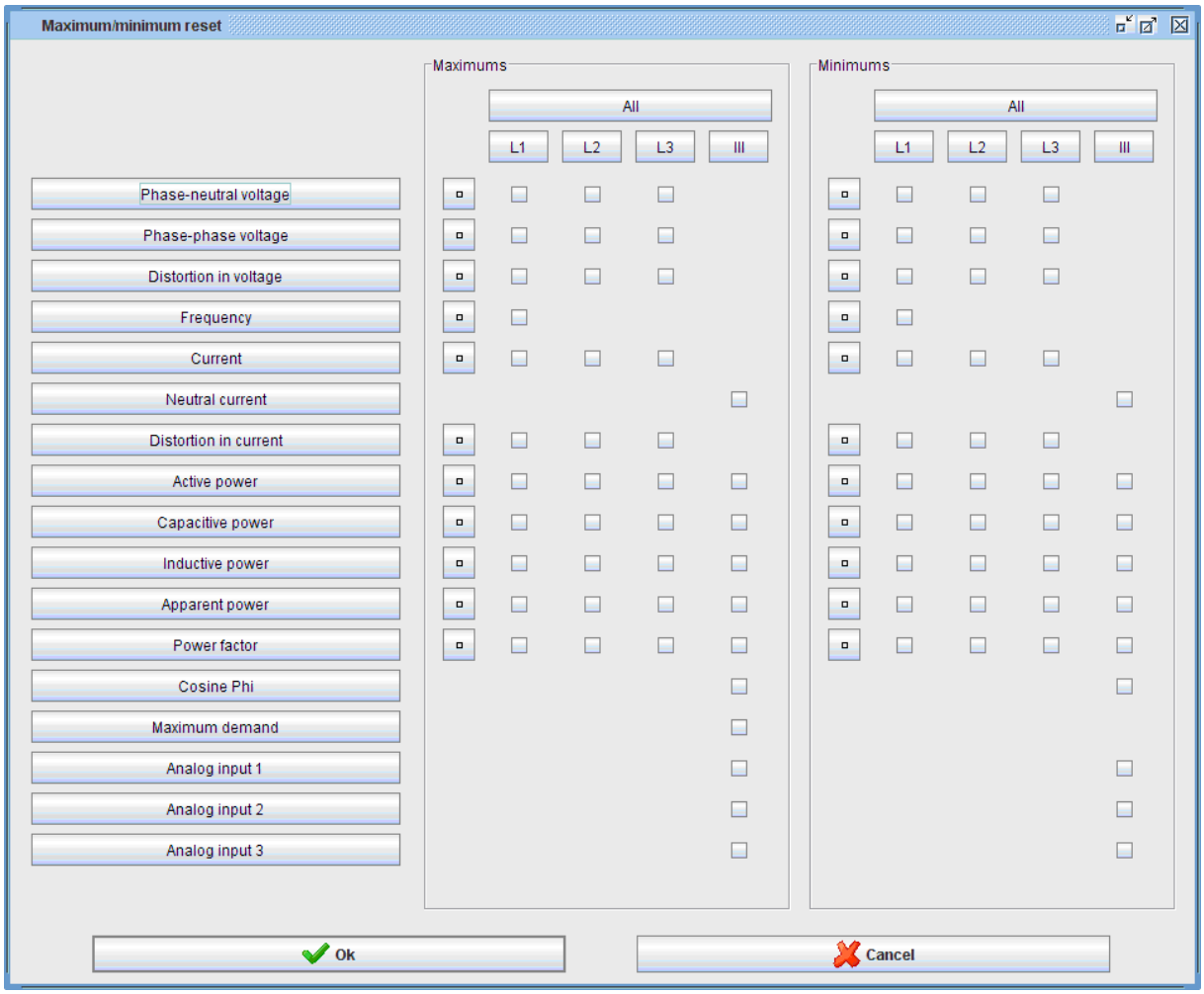
IP camera display screen

In addition to the information already mentioned, some devices allow interaction with the device itself or with the outside environment through the same screen display. Many device view screens provide an option for resetting maximums and minimums. This action is accessed via a button situated somewhere on the screen.



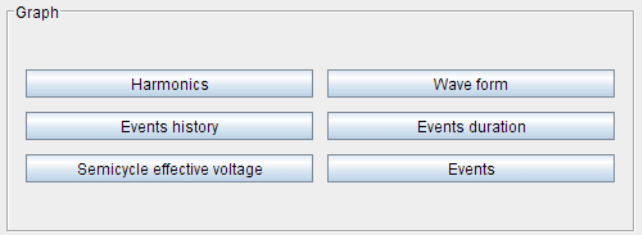
Display screen of equipment with "maximum / minimum reset" button

Clicking on this button will bring up a window where the desired restart values may be selected. Each device provides a window for selecting different variables, depending on the type, the same type of device may even offer a separate window depending on how it is configured.



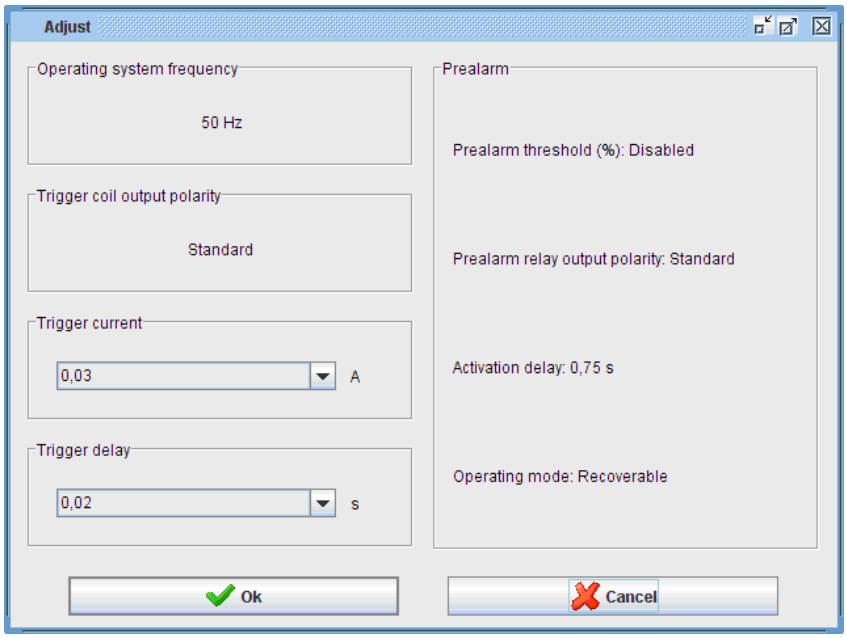
"Maximum / minimum reset" window

Another typical interaction is by clicking on a button. This can include many different kinds, from acting on any digital output of the equipment or on any aspect of the configuration, to launching a special graph or viewing the table of historical events.



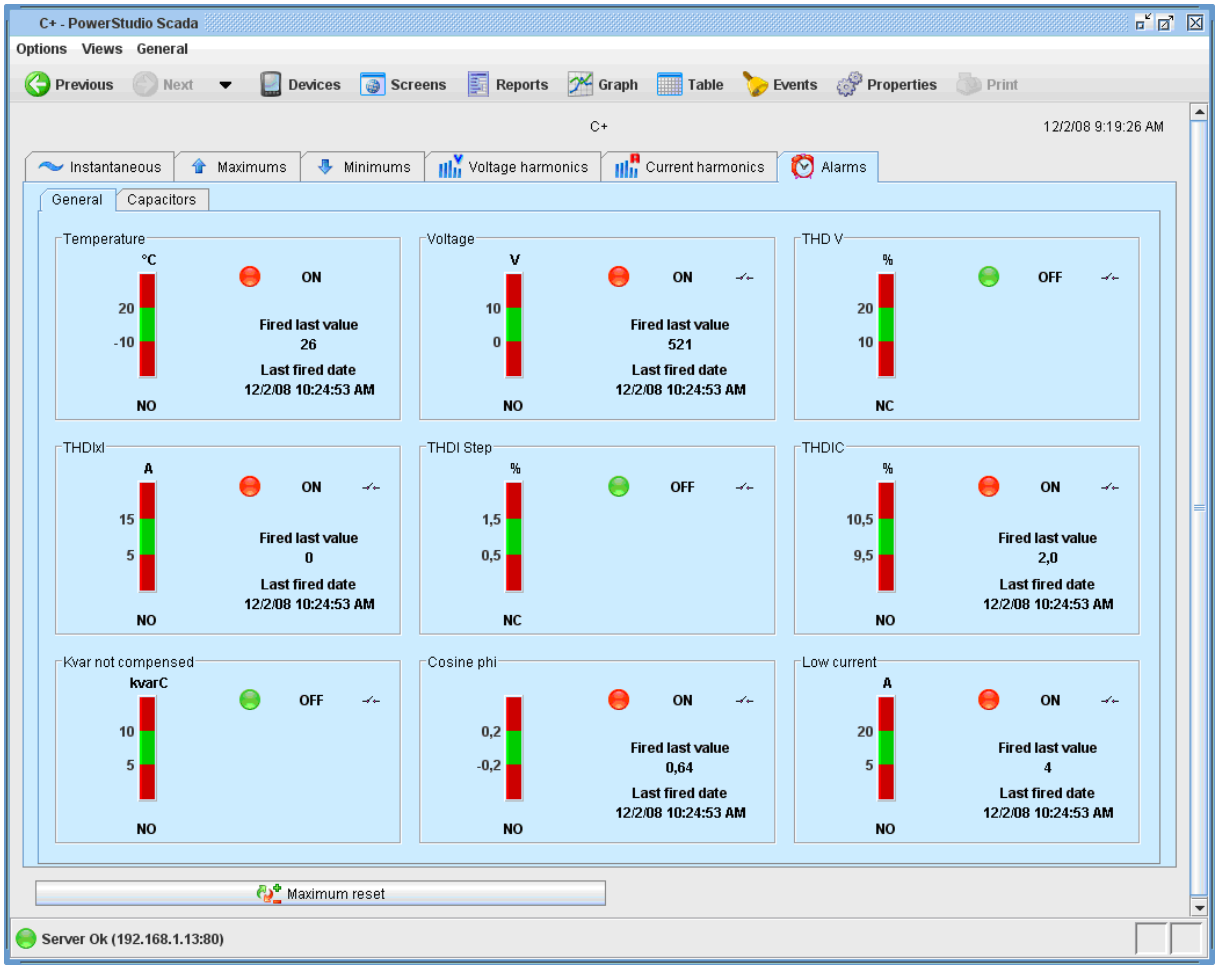
Buttons to launch special graphs on the QNA screen

There are devices that provide more elaborate interactions, enabling adjustments and more complex configurations by clicking on a button through a specific configuration window. For example, RGU-10 type devices allow current triggering values and trigger delay to be adjusted.



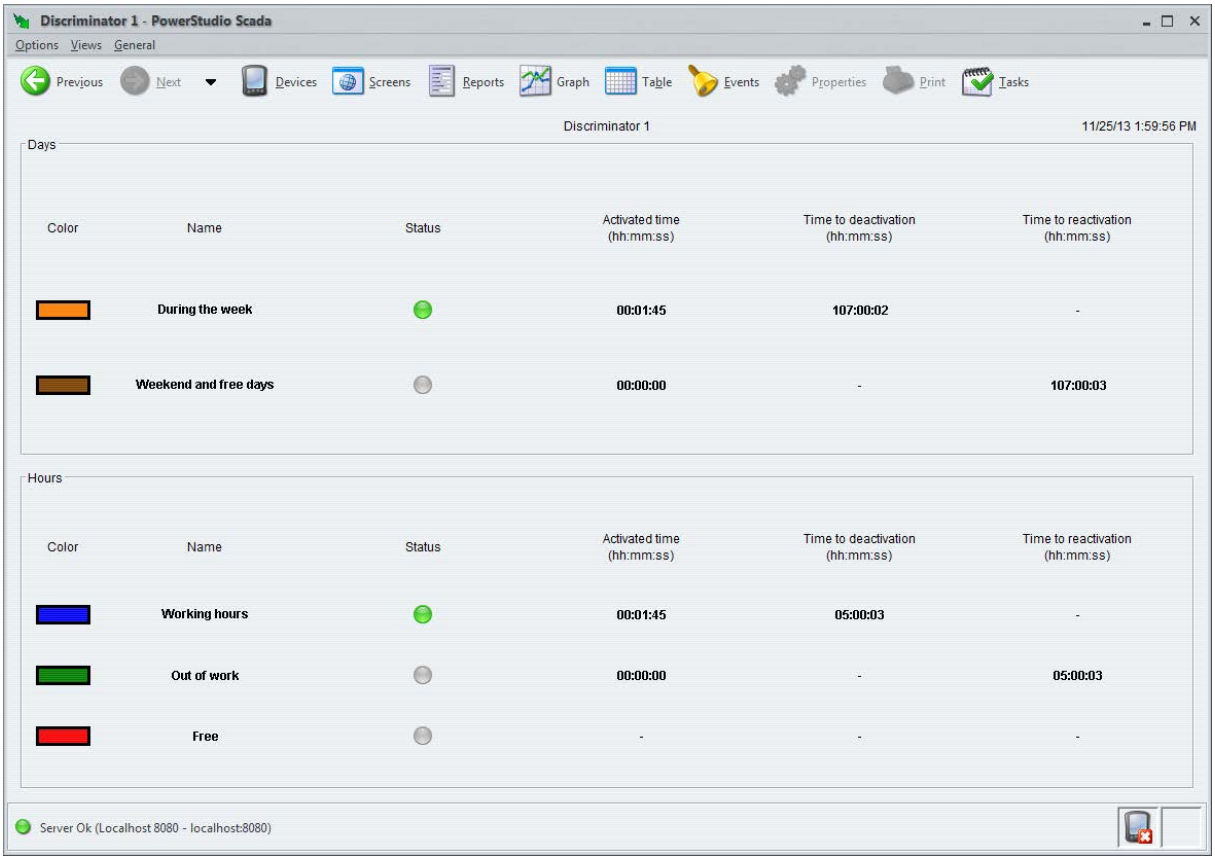
RGU-10 parameter adjustment window

From the monitoring view of a device it is faster to make a graph or a table, either through a direct button in the view itself (as in the case of QNA equipment) or directly by clicking on the corresponding buttons on the toolbar. This second option will be explained in the following section.

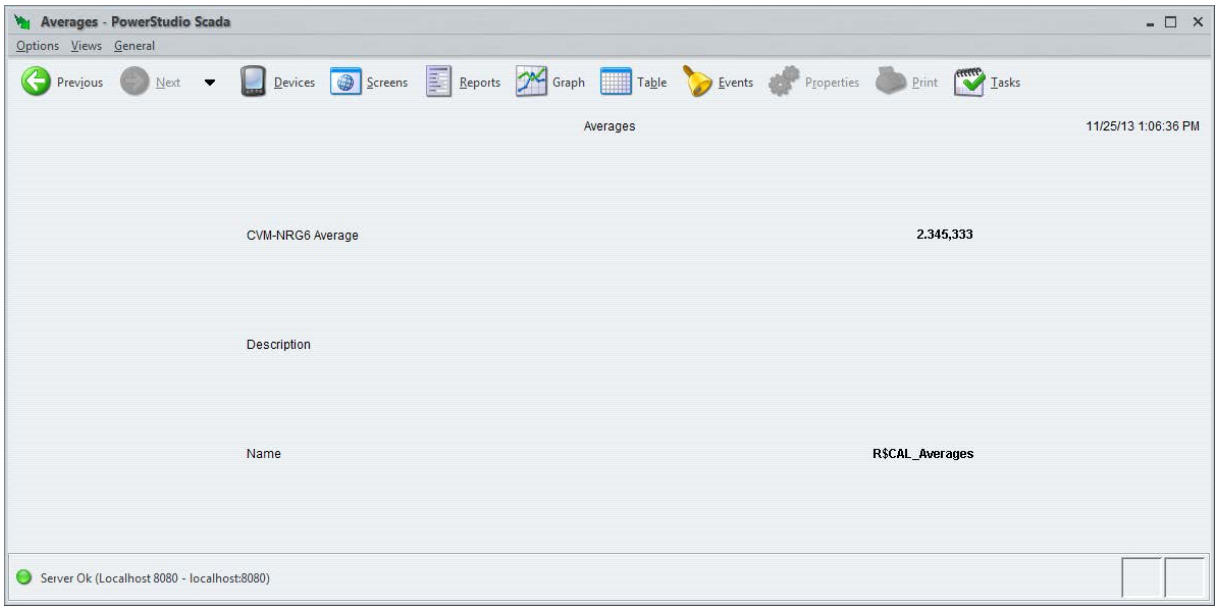


Another of the special screens is the Computer Plus device alarms. If triggered by NC (normally closed) or NO (normally open), each alarm displays a level bar with the maximum and minimum configured value, value and date of last trigger, whether the alarm is currently triggered and whether the alarm is assigned to the global relay.

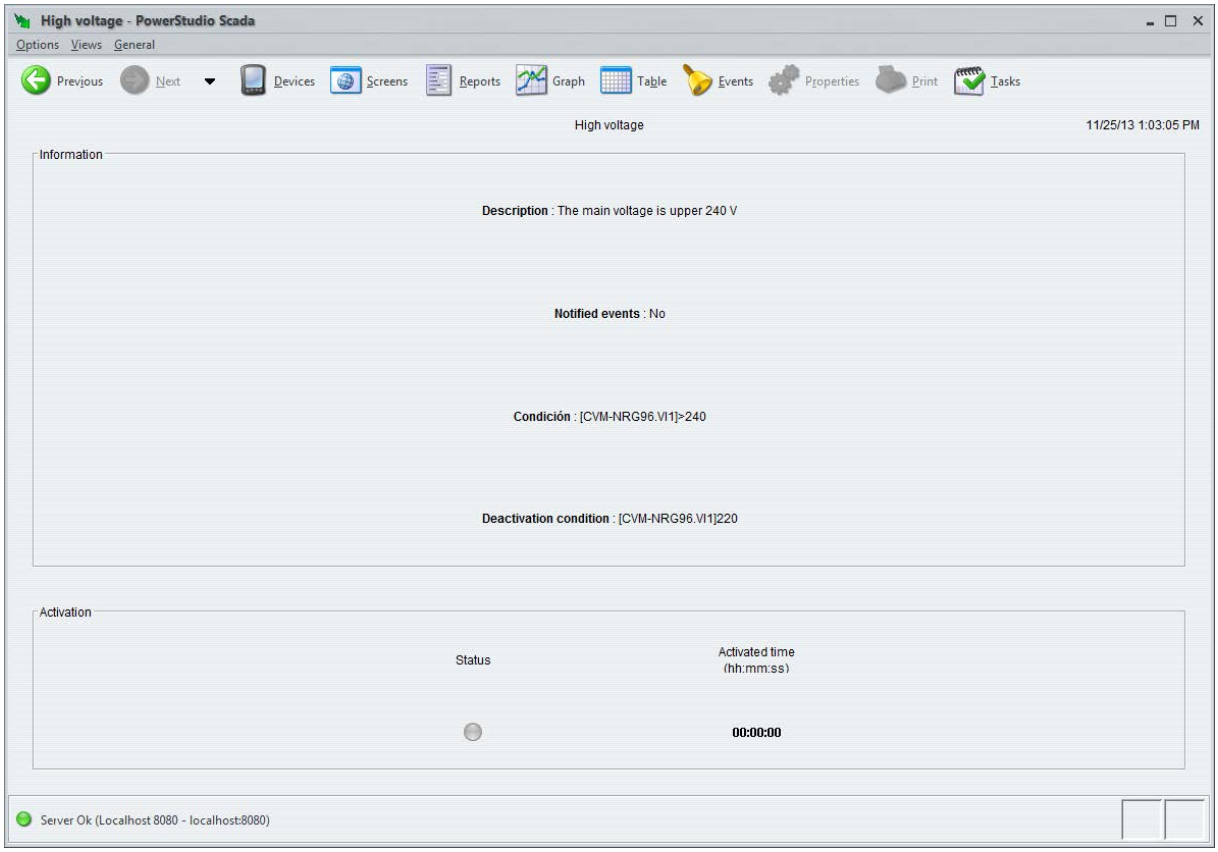
On the other hand, this version can also display other types of devices, i.e., events, discriminators, zones and calculated variables will be displayed by the Java client and HTML5. An example of each display is shown below:


Discriminator 1 - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print Tasks
Discriminator 1
11/25/13 1:59:56 PM
Days
Color Name Status Activated time (hh:mm:ss) Time to deactivation (hh:mm:ss) Time to reactivation (hh:mm:ss)
During the week 00:01:45 107:00:02 -
Weekend and free days 00:00:00 - 107:00:03
Hours
Color Name Status Activated time (hh:mm:ss) Time to deactivation (hh:mm:ss) Time to reactivation (hh:mm:ss)
Working hours 00:01:45 05:00:03 -
Out of work 00:00:00 - 05:00:03
Free - - -
Server Ok (Localhost 8080 - localhost:8080)

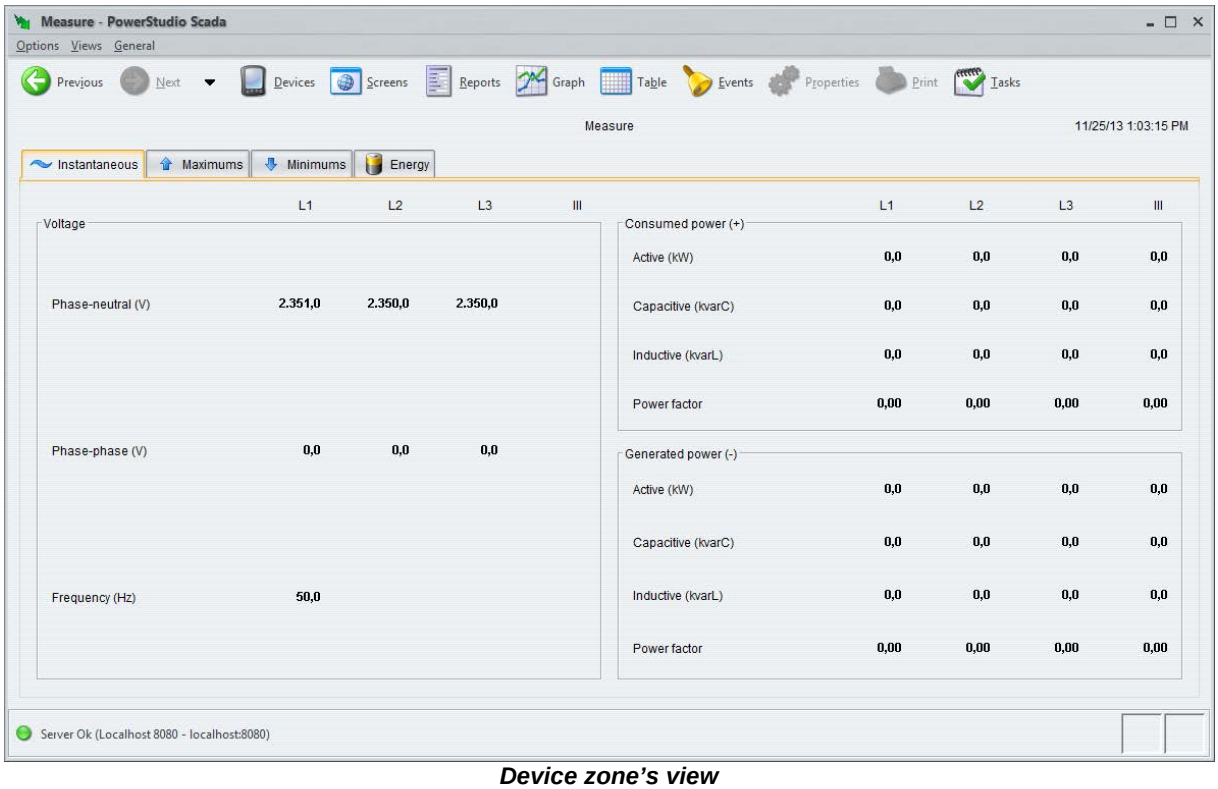
Discriminator's view



Calculated variables view



Event's view

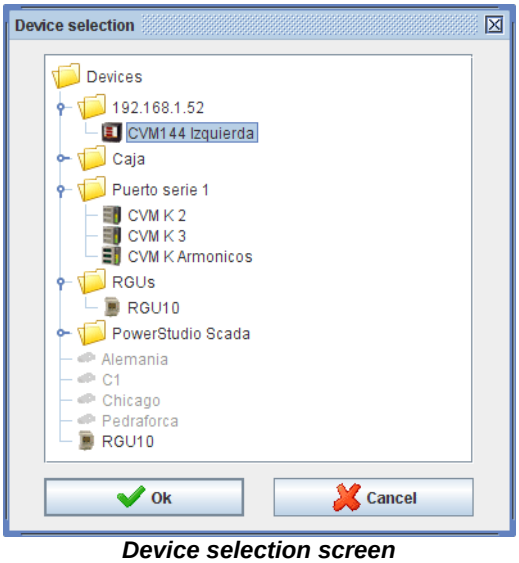

Measure - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print Tasks
Measure
11/25/13 1:03:15 PM
Instantaneous Maximums Minimums Energy
Voltage
L1 L2 L3 III
Phase-neutral (V) 2.351,0 2.350,0 2.350,0
Phase-phase (V) 0,0 0,0 0,0
Frequency (Hz) 50,0
Consumed power (+)
L1 L2 L3 III
Active (kW) 0,0 0,0 0,0 0,0
Capacitive (kvarC) 0,0 0,0 0,0 0,0
Inductive (kvarL) 0,0 0,0 0,0 0,0
Power factor 0,00 0,00 0,00 0,00
Generated power (-)
Active (kW) 0,0 0,0 0,0 0,0
Capacitive (kvarC) 0,0 0,0 0,0 0,0
Inductive (kvarL) 0,0 0,0 0,0 0,0
Power factor 0,00 0,00 0,00 0,00
Server Ok (Localhost 8080 - localhost:8080)

Device zone's view

1.2.9 Making graphs

One of the most powerful tools of the client is the possibility of making graphs of the device variables (trends). This view can be accessed using the "*Views*" menu option, then "*Studio*" and finally "*Graph*" or directly from the "*Graph*" button on the toolbar. Graphs can be made from a predefined SCADA screen where the graph control has been added or, as mentioned in the previous chapter, from the buttons defined for this purpose in some types of device monitoring views (e.g. a QNA monitoring view).

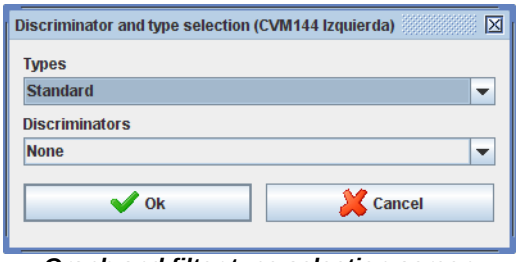
Typically, to make a graph the variables of the device that will be part of it need to be chosen. Thus, when accessing the "*Graph option*" from the main menu or from the toolbar, first a dialogue will appear which allows selection of the device from which the variables will be chosen, and that will be part of the graph.



Device selection screen

At first only variables from the same device may be chosen to create the graph, later variables from other devices may be added (this will be explained further on). If the "*Graph*" option is selected while in device monitoring the client application will understand that a graph of what is being displayed is desired and will skip back to the previous screen.

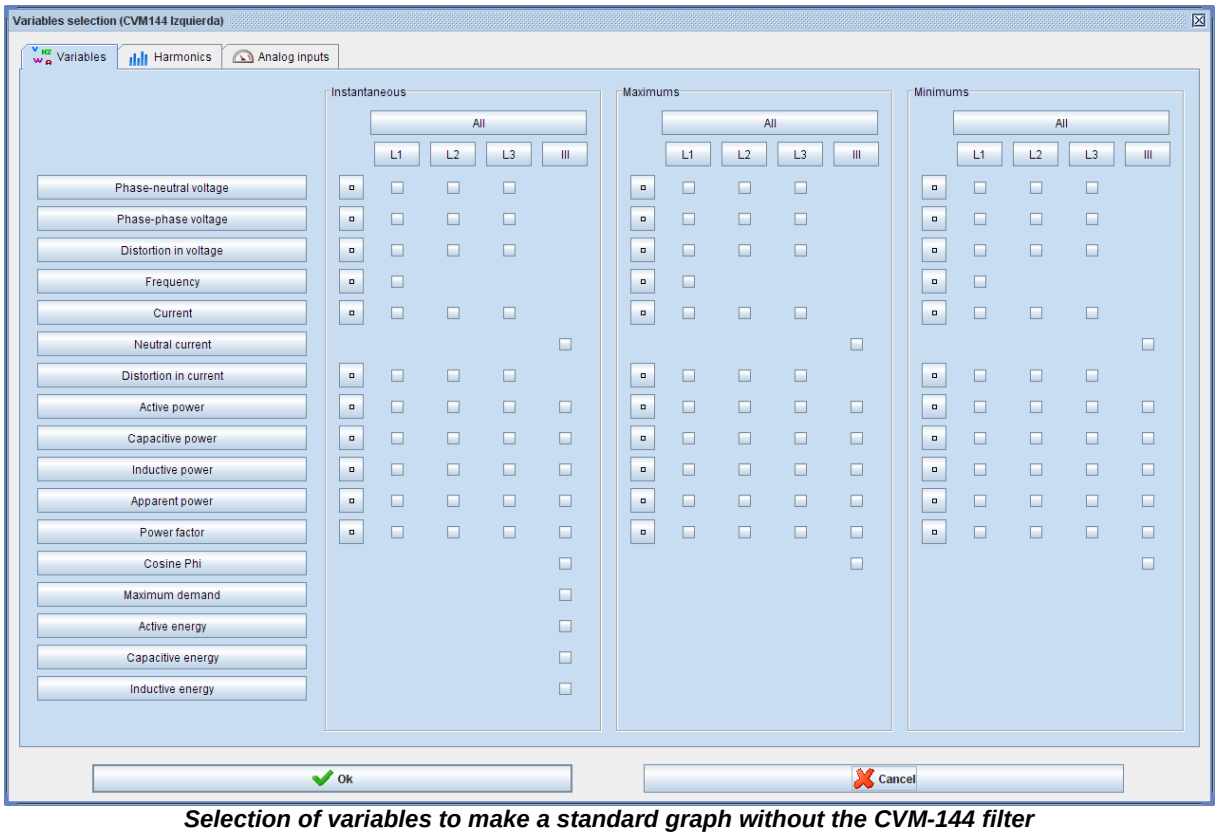
Depending on the device chosen, a screen will then appear to select the type of graph and the filter to be applied.



Graph and filter type selection screen

Note only certain types of graphs can be filtered, usually the standard type, if the graph type chosen cannot be filtered the "*filter*" option will be disabled. If a default filter has been defined for the equipment, it may still be modified or another one chosen, or it may be disabled. It is also possible that the equipment does not allow more than one type of graph, and that there are no filters defined, or they are not applicable to this type of graph; in which case this screen will not appear and will pass directly to selection of variables for the device in question.

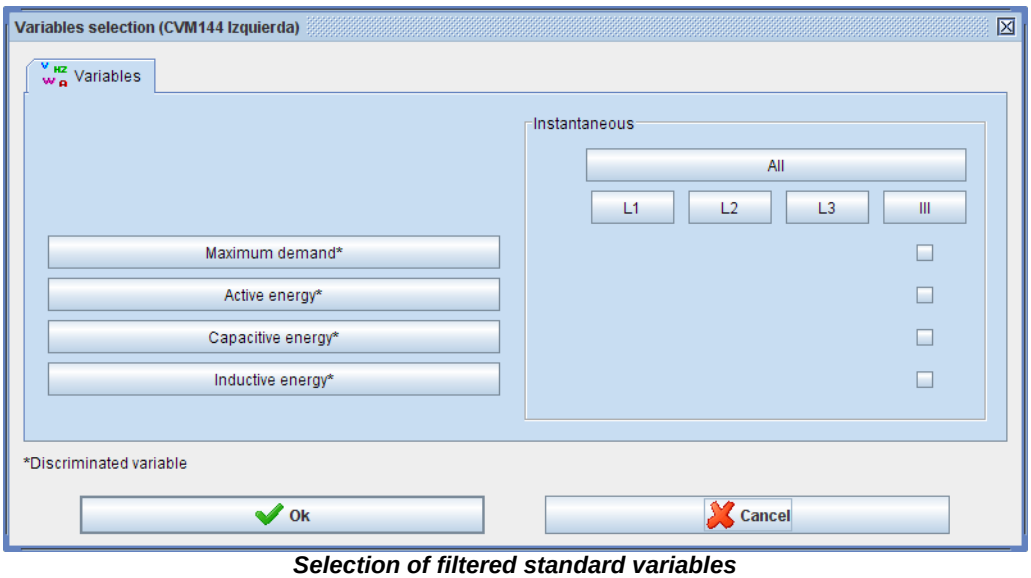
After selecting the figure type and filter, the variables selection screen will appear.



Selection of variables to make a standard graph without the CVM-144 filter

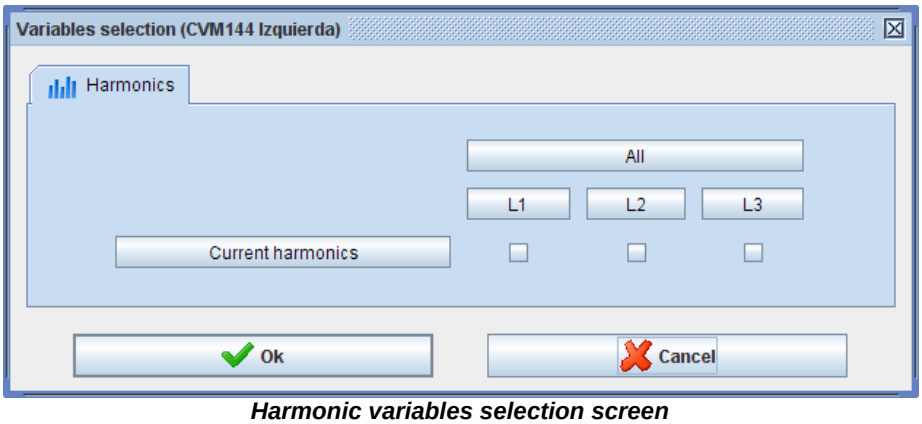
Choose the desired graph variables here. This screen will depend on the device, the type of graph required and the filter desired to implement these variables.

For example, if a filter is chosen a screen similar to the following may be found:



Selection of filtered standard variables

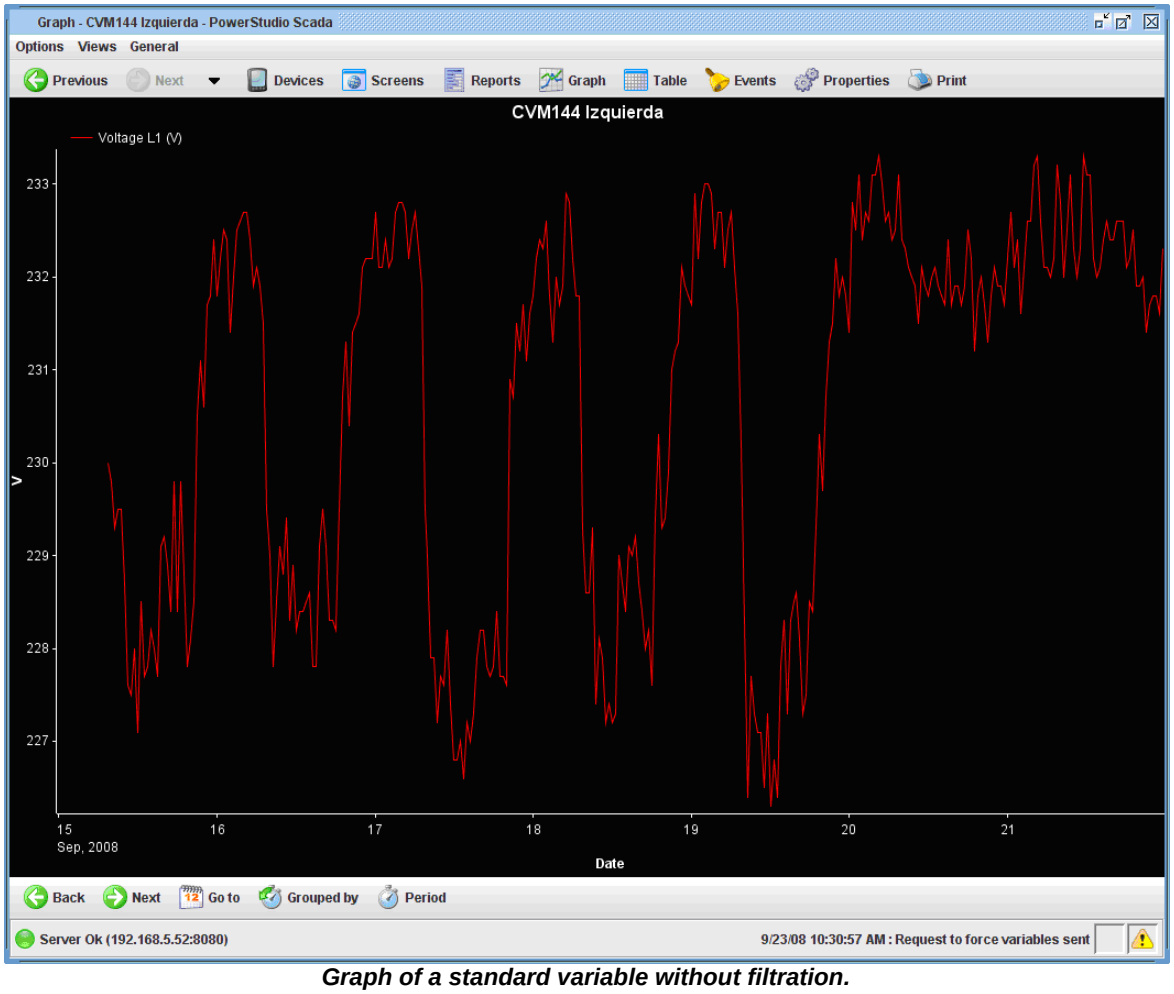
If non-standard type of graph is selected, for example a harmonics graph, the following variable selection screen appears:



Harmonic variables selection screen

Once variable display selection has been made, the graph with the variables in question will appear.

The system automatically chooses the representation period and the grouping of data, which can obviously be changed later. Later we will explain what the two concepts mean and how they can be changed. It should be noted that the grouping chosen is a week and the period is typically 30 minutes. If the graph we are accessing comes from graph control on a SCADA screen, both the grouping and the period are determined in the control and need not be predetermined by default. However, as always, both properties can be modified in the graph view later. Similarly certain types of representations are chosen by default (line, bars, etc.), as well as a few colors and a distribution of the variables in axes and areas depending on the variables represented. All these characteristics can be modified later at will. A description of what they mean and how they are modified will be explained later.



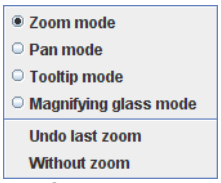
Graph of a standard variable without filtration.

As can be seen a typical graph consists of a series of common characteristics:

- ***Title:*** Situated on the upper area, this is a text describing the graph being viewed. Typically, the names of devices forming part of the displayed variables are shown. They may contain several lines of text, so that they can be represented as subtitles.
- ***Representation areas:*** These are areas where data may be viewed. Typically, a graph consists of one area, as in the previous example, but there may be several, each under the next. Each area contains some common characteristics:
    - ***Key:*** Provides general information about the variables that are represented in the area. This information is often the color of the variable, the type of representation, the title of the graph, and in some cases, a value indicating some feature of the variable for the current representation (for example it is typical to see on energy variables the accumulated value of all the visible values).
    - ***Y-Axis:*** Provides information on the units of the variables that are represented in this axis and the range of values that are being displayed. At first the range is calculated so that they fit all the values of all the variables included in this axis. Typically, an area has a y-axis, although this may be modified by the user as will be explained later.
    - ***X-axis:*** Typically, this is the time axis and is located at the bottom of the representation area. Here the time interval being represented may be seen. Usually predefined time intervals are represented (day, month, etc.). But the user can choose the most suitable as can be seen later. Similarly, there are types of graphs where this axis does not represent time, in this case the units represented and the range of values contained will be indicated.
    - ***Drawing area:*** Contains the actual figure representing the variables of the area in question. There is a drawing area for each area of representation.
- ***Toolbar:*** Contains a series of actions that can be performed on the graph. Depending on the type of graph it will contain more or fewer options. The typical actions are going to the previous interval, going to the next, going to a user-defined interval, grouping according to a predefined interval or changing the grouping period.

Any graph can always be found in the so-called "operating mode", which determines the behaviour of the drawing area and the use of the mouse on it. There are four possible modes of operation:

- ***Zoom mode:*** Allows enlargements be made on one portion of the graph. This mode is accessed through the F1 key or the corresponding graph context menu option.
- ***Panning Mode:*** Allows the current window to be moved using the mouse, dragging and dropping. This mode is only available if a Zoom has already been carried out. It is accessed by the F1 key or the corresponding graph context menu option.
- ***Tooltip Mode:*** Allows variable values viewing at the position cursor. This mode is accessed with the F3 key or the related context menu option.
- ***Magnifying glass Mode:*** Enables the area under the cursor to be enlarged in a separate window. This mode is accessed with the F4 key or the related context menu option.



Graph context menu

1.2.9.1 Zoom mode

The zoom mode permits magnification of a portion of the drawing area with the mouse. In this mode the cursor looks like a magnifying glass.

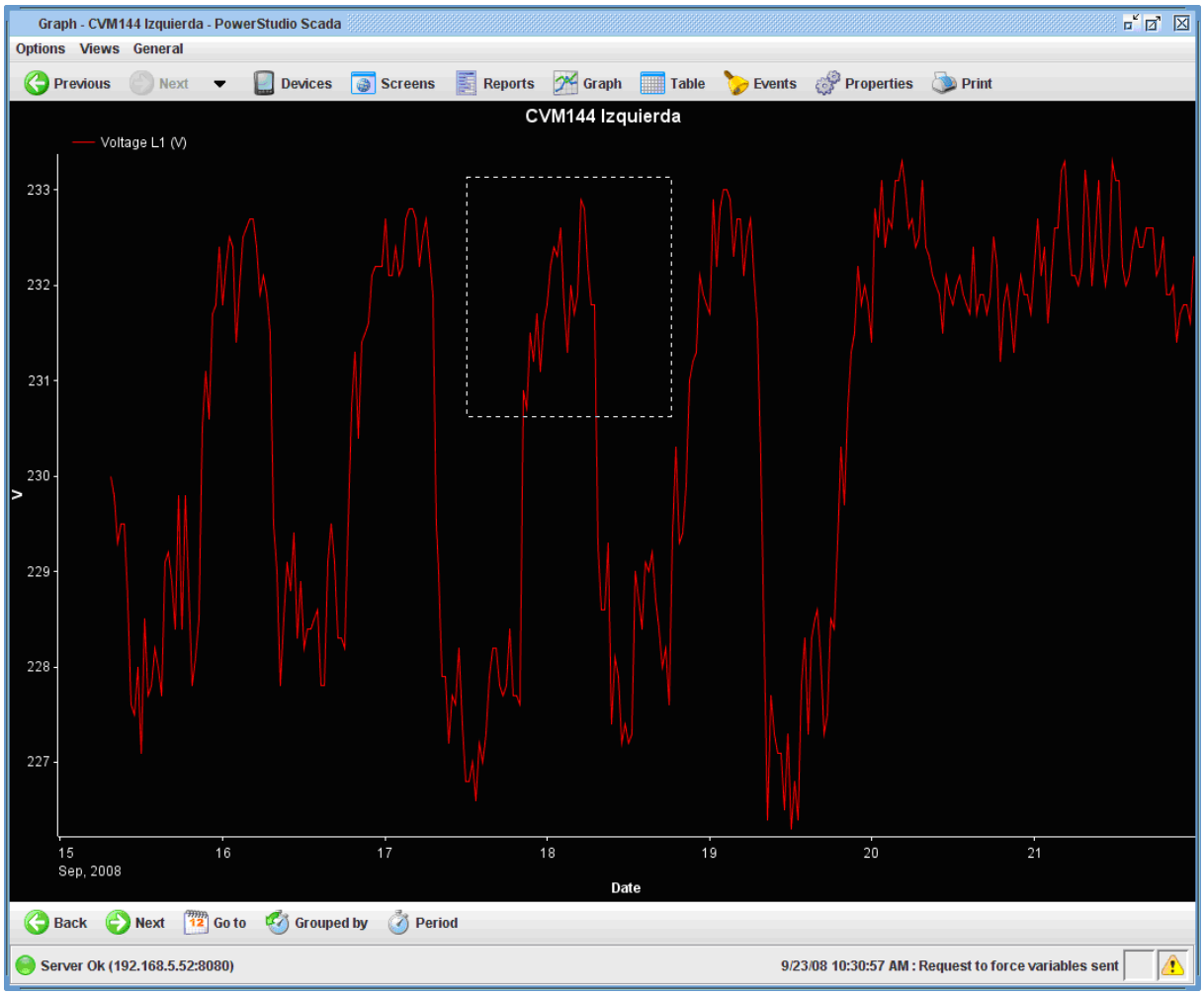
Appearance of cursor in zoom mode (when zooming is possible and when not)

The cursor indicates whether or not it is over an area where magnification is possible (typically not outside the drawing). To start an enlargement, left click on the drawing point where one corner of the new viewing window is desired and, without releasing the button, move the cursor to the point the opposite corner of that window should be.

It is interesting to see that while moving the cursor discontinuous lines indicating what will be the new viewing window will appear if the button is released. The cursor also reports whether or not the selected area is valid as a new viewing window by changing the appearance of the mouse cursor.

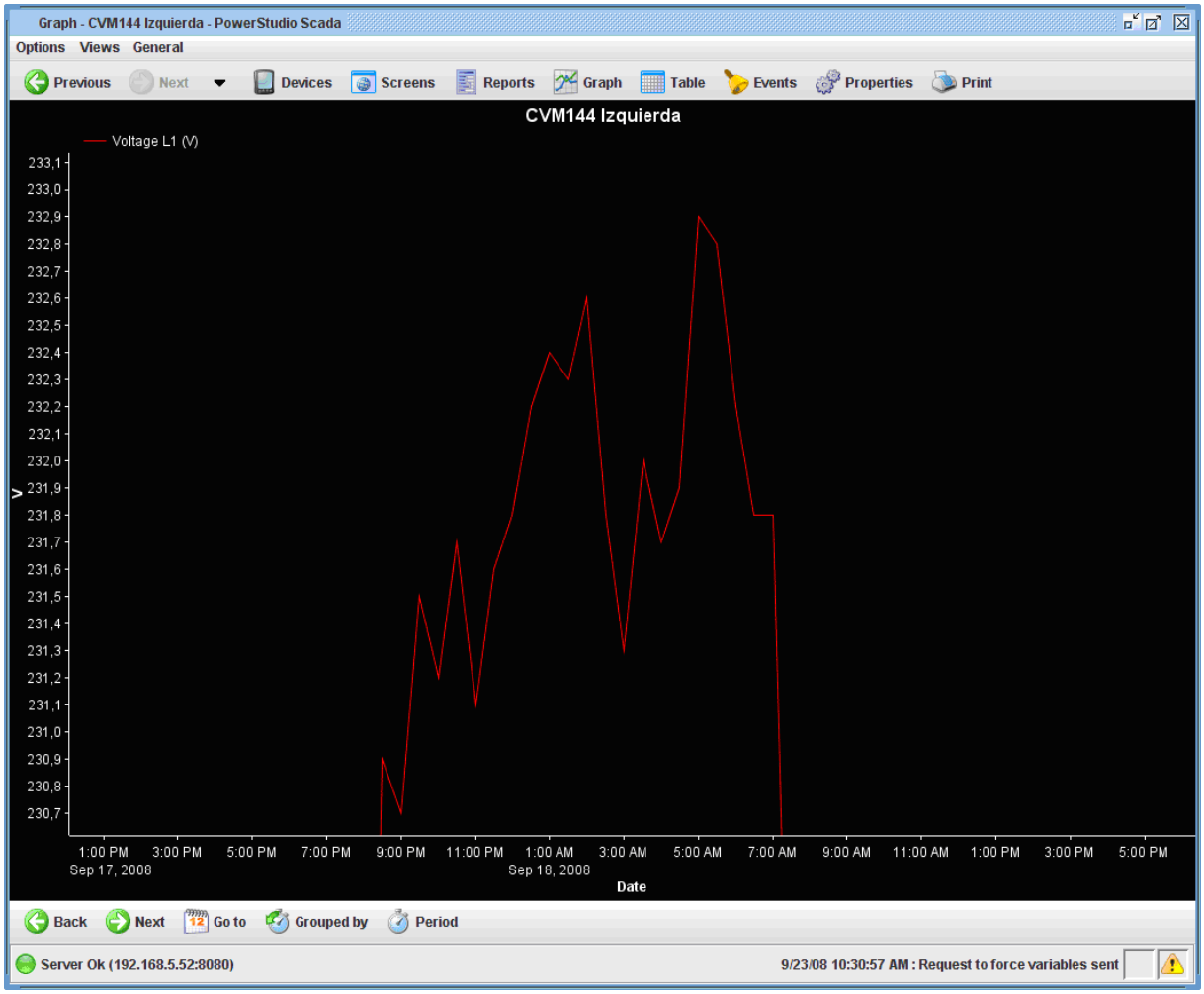
The new viewing window is invalid or is not permitted

This may be because it is too small, narrow or wide, both in window units (pixels) and variable units, both in the X axis and the Y. For example, where the variable period is one hour magnification of an area of the drawing of less than an hour on the X axis is not permitted.



Magnifying an area of the drawing in the Zoom mode

Releasing the left mouse button accepts the discontinuous window as a new display window. The action will be automatically executed and the enlarged area chosen will be displayed.


Graph - CVM144 Izquierda - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
CVM144 Izquierda
Voltage L1 (V)
233,1 233,0 232,9 232,8 232,7 232,6 232,5 232,4 232,3 232,2 232,1 232,0 231,9 231,8 231,7 231,6 231,5 231,4 231,3 231,2 231,1 231,0 230,9 230,8 230,7
V
1:00 PM 3:00 PM 5:00 PM 7:00 PM 9:00 PM 11:00 PM 1:00 AM 3:00 AM 5:00 AM 7:00 AM 9:00 AM 11:00 AM 1:00 PM 3:00 PM 5:00 PM
Sep 17, 2008
Sep 18, 2008
Date
Back Next Go to Grouped by Period
Server Ok (192.168.5.52:8080)
9/23/08 10:30:57 AM : Request to force variables sent

Graph with the enlargement of a specific area

The process can be repeated as many times as desired, provided the system permits it. Enlarging enables the "*Pan mode*"; which will be described later, as well as the "*Remove last zoom*" and *Without zoom*" options in the context menu.

The "*Remove last zoom*" option displays the previous enlargement, namely the display from which the present enlargement was made, while the "*Without zoom*" option eliminates all enlargements at once.

Enlarging a chart with several display areas is worth commenting on. If an enlargement is made on a graph of this type it can be seen that not only do areas marked off with dashed lines appear in the display area, but they also appear in other areas too, selecting the same interval X (usually time).

Zooming in with a graph with several areas of representation selected in the first zone

This behaviour is defined by default, giving priority to conserving the same X-axis in all areas (it is usually useful to compare values with the same dates or intervals, and therefore does not apply if the X- axes are different, and is only included in the enlargement of those areas with similar X-axes , although they are not consecutive). Note that when the enlargement is carried out in more than one area all the new selections are horizontal.

The behaviour of "*Zoom mode*" can be changed by varying the idea previously discussed using the "Control" or "Shift" keys while selecting the new display window.

The "Control" key forces the selection to include only the area where the enlargement is being made; therefore if the graph consists of a single area this modifier has no effect. If the enlargement is being made between two different areas (one corner of the new window is in one area and the other in a different area), only the areas between the two are included.

For example, if the enlargement is started in the first area and finished in the second, only these two areas and not the third will be enlarged. A curious effect caused by this mode is that areas with different X-axes can appear. In addition, this behaviour does not take into account whether the X-axes are equal or not, always forcing the enlargement regardless of this information, thus allowing the expansion of two zones with different X-axes, something that would be impossible with the default behaviour.

Graph with areas with different X axes (the first zone has an X-axis different from the other two)

The "*Shift*" key forces the enlargement to only affect the X-axis, even in the area where the expansion is taking place, but keeps the enlargement of all the areas maintaining the X-axis, as in the default behaviour. Note that if a graph consists of a single area this change in behaviour causes the non-selection of the new viewing window not to affect the Y-axis

The combination of behaviours, Clicking the "*Control*" key and the "*Shift*" key at the same time will enable enlargement of graphs with more than one representation area, a single area depending on their X-axis. The user can freely combine the various behaviours in successive enlargements.

1.2.9.2 Panning mode

"*Panning mode*" is available when an enlargement is in effect, enabling viewing window movement using the drag and drop technique. In this mode the cursor looks like a hand.

Appearance of the cursor in the pan mode (when it is possible to start the pan and when not)

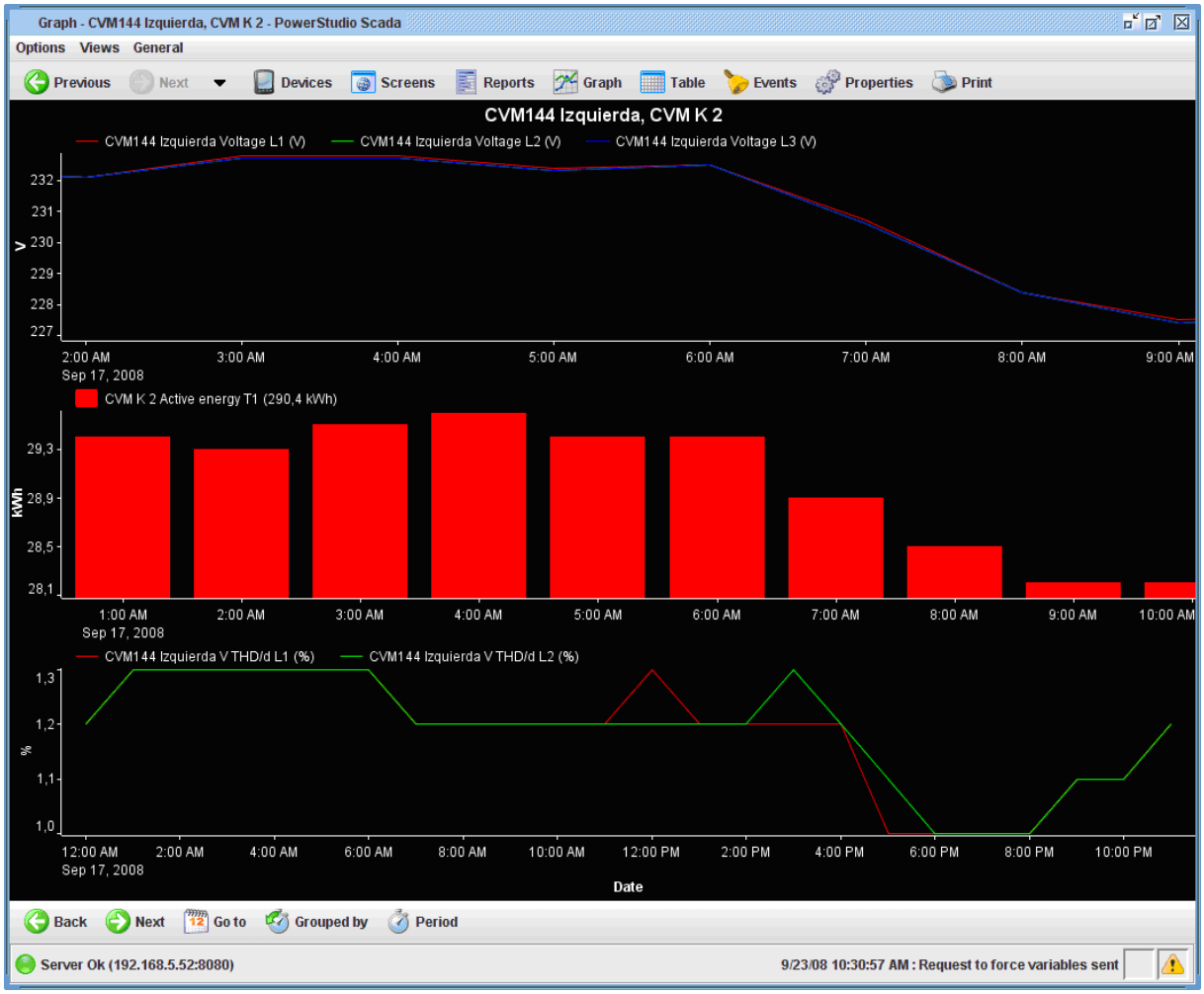
As you can see the cursor indicates whether or not it is possible to move the viewing window (typically not when out of the drawing zone). To start a movement left click on the point of the drawing desired as an anchor and, without releasing the button, drag the cursor to move the window to the desired location. Note that the window moves in real time with cursor movement.

It is interesting to see that once the anchor is positioned the cursor will change to indicate the viewing window may be moved.

Cursor indicating that viewing window may be moved

Movement is limited by the margins of the viewing window before making the first enlargement. Therefore, if viewing a week of data, movement cannot be made to the previous or following week using the pan option, or on top of the upper margin of the Y-axis, or below the lower margin of the axis itself.

In graphs with more than one display area the pan mode establishes, by default, behaviour by which all areas with the same X-axis as the area where the anchor is established must move. This behaviour can be changed using the "*Control*" key. Holding down the key while moving the window indicates to the program that only the window on which the anchor is established must move. This will cause the X-axes to be unequal.


Graph - CVM144 Izquierda, CVM K 2 - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
CVM144 Izquierda, CVM K 2
CVM144 Izquierda Voltage L1 (V)
CVM144 Izquierda Voltage L2 (V)
CVM144 Izquierda Voltage L3 (V)
V
232 231 230 229 228 227
2:00 AM 3:00 AM 4:00 AM 5:00 AM 6:00 AM 7:00 AM 8:00 AM 9:00 AM
Sep 17, 2008
CVM K 2 Active energy T1 (290,4 kWh)
kWh
29,3 28,9 28,5 28,1
1:00 AM 2:00 AM 3:00 AM 4:00 AM 5:00 AM 6:00 AM 7:00 AM 8:00 AM 9:00 AM 10:00 AM
Sep 17, 2008
CVM144 Izquierda V THD/d L1 (%)
CVM144 Izquierda V THD/d L2 (%)
%
1,3 1,2 1,1 1,0
12:00 AM 2:00 AM 4:00 AM 6:00 AM 8:00 AM 10:00 AM 12:00 PM 2:00 PM 4:00 PM 6:00 PM 8:00 PM 10:00 PM
Sep 17, 2008
Date
Back Next Go to Grouped by Period
Server Ok (192.168.5.52:8080)
9/23/08 10:30:57 AM : Request to force variables sent

Graph with different X-axes in all display areas

1.2.9.3 Tooltip mode

The "*Tooltip mode*" displays the values of variables located closest to the cursor with respect to the X-axis. These values are updated instantly as the cursor is moved. In this mode the cursor looks like a hand.

Cursor indicating Tooltip mode

The mode behaves in such a way as to show the values closest to the mouse position with respect to the X-axis of all the areas that share the same X-axis.

Graph - CVM144 Izquierda, CVM K 2 - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
CVM144 Izquierda, CVM K 2
CVM144 Izquierda Voltage L1 (V)
CVM144 Izquierda Voltage L2 (V)
CVM144 Izquierda Voltage L3 (V)
V
Sep 17, 2008 2:00 PM
CVM144 Izquierda Voltage L1: 227,2 V
CVM144 Izquierda Voltage L2: 227,2 V
CVM144 Izquierda Voltage L3: 227,2 V
CVM K 2 Active energy T1 (689,1 kWh)
kWh
Sep 17, 2008 2:00 PM
CVM K 2 Active energy T1: 14,1 kWh
CVM144 Izquierda V THD/d L1 (%)
CVM144 Izquierda V THD/d L2 (%)
%
Sep 17, 2008 2:00 PM
CVM144 Izquierda V THD/d L1: 1,2 %
CVM144 Izquierda V THD/d L2: 1,2 %
12:00 AM Sep 17, 2008
Date
Back Next Go to Grouped by Period
Server Ok (192.168.5.52:8080)
9/23/08 10:30:57 AM : Request to force variables sent

Graph in Tooltip mode

For each area of representation with the same X-axis a window is shown with the value of the X-axis (typically the date) and information about the variables that are represented in this X position (typically the variable name, its value and its units).

The behaviour of this mode is changed by clicking the "*Control*" key, so as to show only the information window of the area at the cursor location.

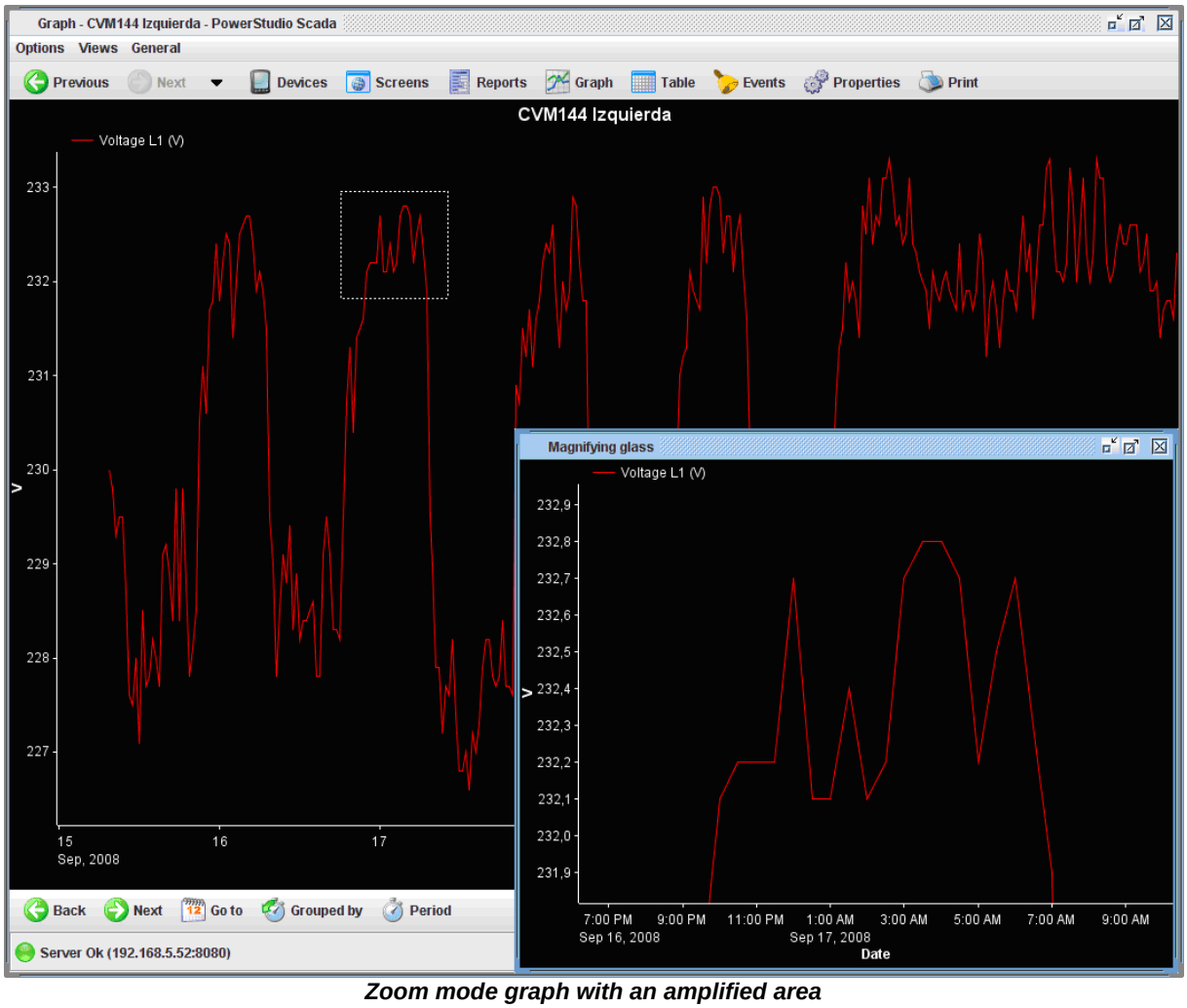
In graphs with a high density of values several different values with different X coordinates of a variable may fall into the same cursor position. In this case there will be no values accessible through cursor movement. To access all the values, without omitting any, the value display window may be moved using the cursor keys (left or right), these keys allow movement to the value immediately before or immediately after the current, although this is drawn in the same screen position.

With some types of graphs there is more than one value of the same variable at the same X-coordinate. This does not happen if the X-axis is time; but it can happen in other cases, as for example in an event duration graph, which will be seen later. In these cases the maximum and minimum value of each variable in that X-coordinate will be shown.

1.2.9.4 Magnifying glass mode

The "*Magnifying glass mode*" displays an enlargement in a separate window for the area around the position of the cursor. The enlargement window is updated instantly as the cursor is moved, always showing the area around it.

If magnifying glass mode is entered, and the cursor remains on the representation area, an enlargement window will automatically appear, and a dotted box will appear in the drawing area indicating that the area represented by the cursor is enlarging, and it may be moved as desired, automatically displaying the enlargement in the superimposed window.



Zoom mode graph with an amplified area

Upon leaving the representation area the enlargement window will disappear, and upon returning, the cursor will have the following appearance:

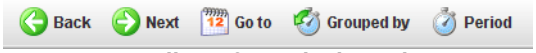
Cursor indicating Magnifying mode in the enabled area

This indicated the cursor is in the magnifying glass area, and that enlargement of the area is possible (by left clicking). Logically, the extension window can be re-sized and positioned as desired like any other window.

Another possibility is to vary the size of the square area around the cursor. This can be done with the mouse wheel or, if the mouse does not have this feature, by using the “+” keys "(greater square area) and" - "(smaller square area).

1.2.9.5 Toolbar

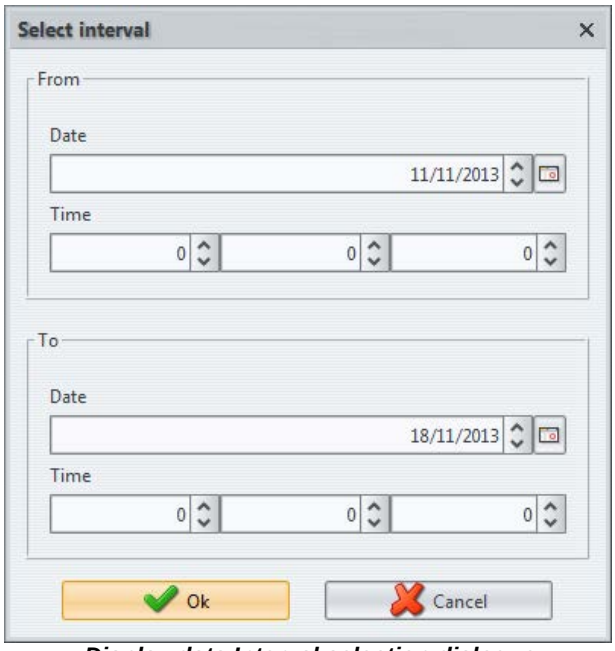
The graphs always have a toolbar at the bottom that allows a series of actions related to the data to be shown.



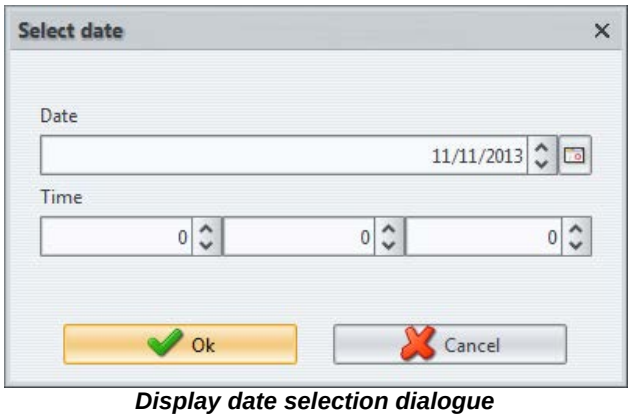
Toolbar of a typical graph

The typical options available in the toolbar are:

- ***Back:*** Displays the previous interval of data. Typically, the range of previous data is a function of data grouping and, if grouped by days, upon going to the previous interval the previous day's data is displayed. There are types of graphs where grouping does not make sense, because they are displaying values of a specific date (for example in QNA harmonics graphs), clicking on this option in this case displays the next date immediately following that contains data.
- ***Next:*** Displays the next interval of data. Typically, the interval of data following this is based on the data grouping and, if grouped by weeks, upon going to the following interval data from the following week is displayed. There are types of graphs where grouping does not make sense, because they are displaying values of a specific date (for example in QNA harmonics graphs), clicking on this option in this case displays the next date immediately following that contains data.
- ***Go to:*** Displays data within a user-defined time interval. There are graphs where it makes no sense to specify an interval (graphic harmonics in QNA), and this permits indication of the exact date desired.

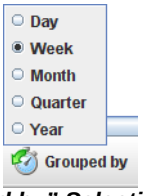


Display data Interval selection dialogue



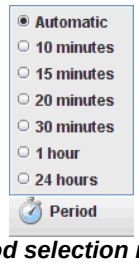
Display date selection dialogue

- ***Grouped by:*** Allows data grouping to be changed. Grouping is just the data interval desired to be displayed. Typically there are five predefined groupings: day, week, month, quarter and year.



"Grouped by" Selection Menu

- ***Period:*** Enables desired date period to be specified. Each device can be configured to store data every so often, typically in periods of 10 or 15 minutes. Use this option view data in a different period, which must always be higher than that defined by the device. Note that this does not change the configuration of the device, which will continue using the period configured by the engine / editor, but will group the data, to a certain extent, to simulate the fact that the device was programd for that period. Note that there is an "*Automatic*" option, which directs the program to choose the period that best suits the selected grouping.



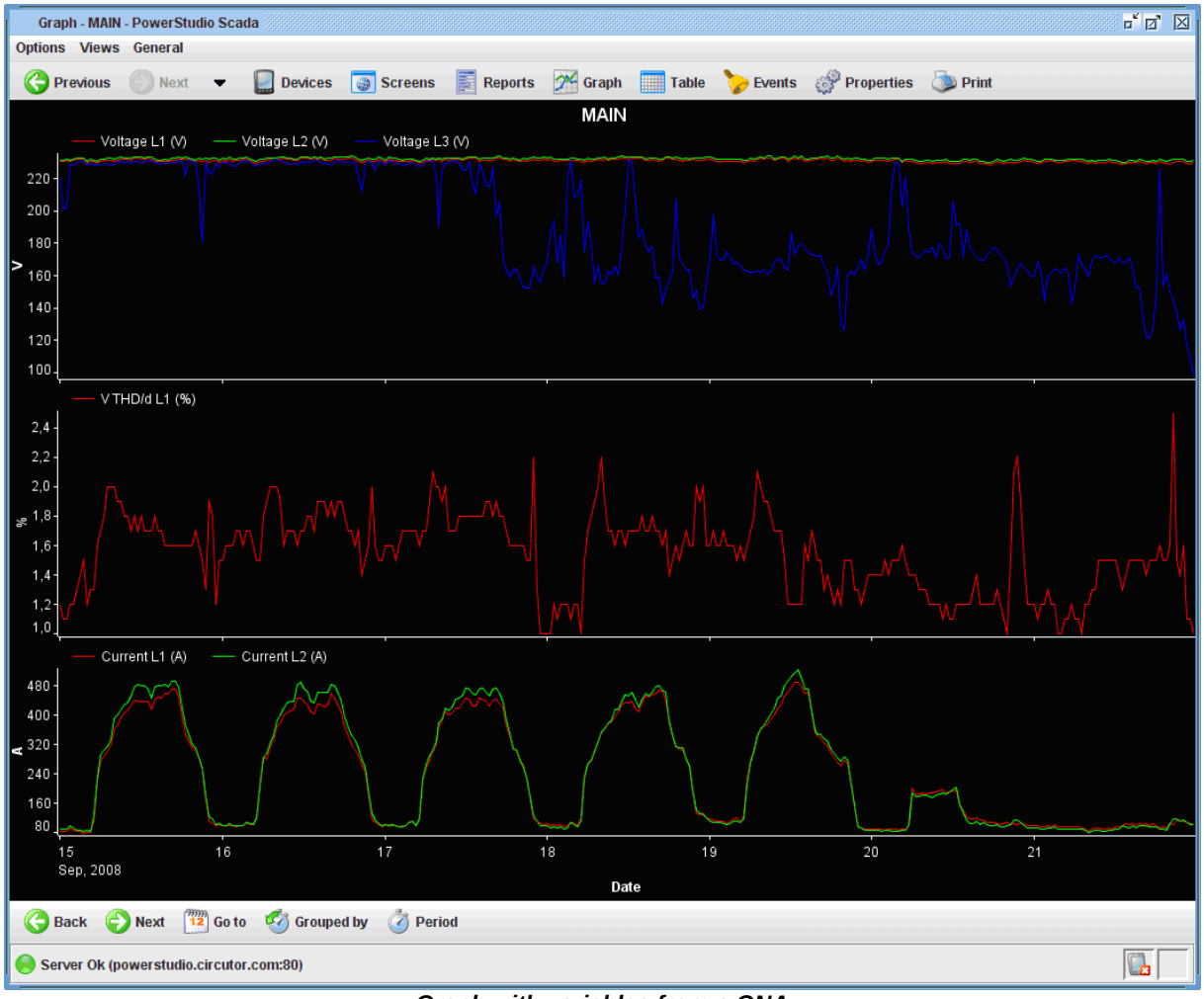
Period selection menu

Note that there are special graphs where the last two options ("*Grouped by*" and "*Period*") are meaningless and therefore not available.

1.2.9.6 Graph properties

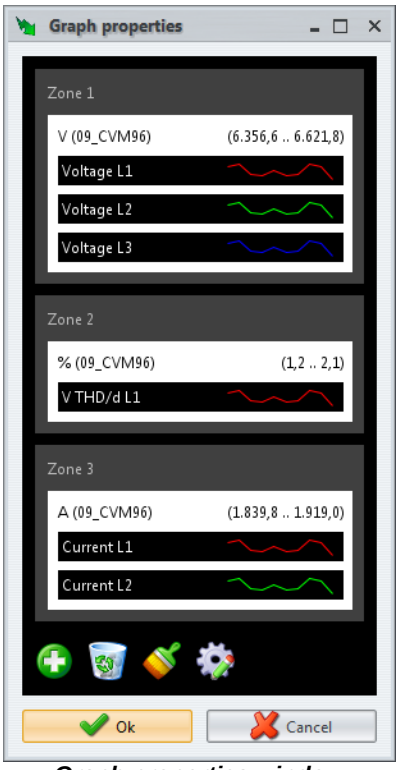
Many more aspects of the representation may be configured using the graph “Properties” option. This option can be accessed using “*Options*” menu, "*Properties*" submenu, or directly through the "*Properties*" button on the main toolbar.

Suppose a graph is made of the variables of three voltage phases, the distortion in phase one, and the current of phase one and two of the QNA measuring equipment. The client provides a view of the graph with default configuration, namely a graph grouped as a week, set at the current week, with 30-minute periods, with three areas of representation (one where all three voltages are placed, another where the distortion is placed and a final one where the two currents are placed) etc.


Graph - MAIN - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
MAIN
Voltage L1 (V) Voltage L2 (V) Voltage L3 (V)
V
V THD/d L1 (%)
%
Current L1 (A) Current L2 (A)
A
15 Sep, 2008 16 17 18 19 20 21
Date
Back Next Go to Grouped by Period
Server Ok (powerstudio.circutor.com:80)

Graph with variables from a QNA

Change the graph properties by accessing the option previously indicated, and a window similar to the following will appear:

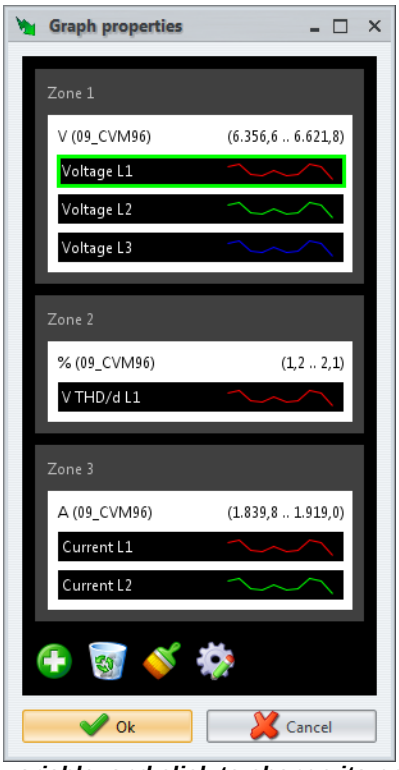


Graph properties window

This window allows the following changes to the graph:

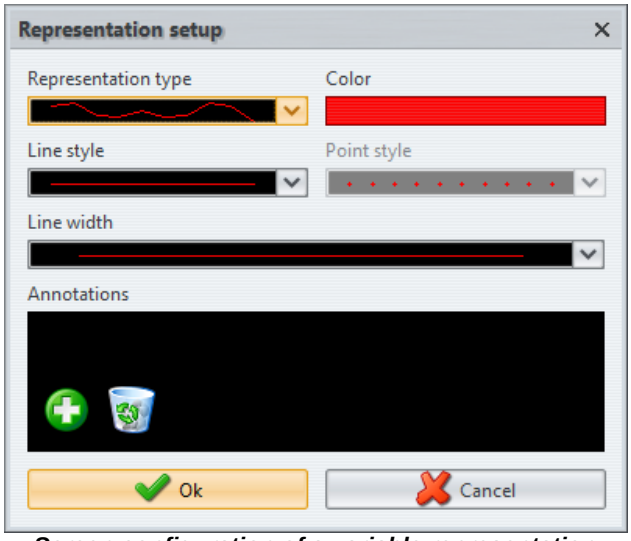
- Modify the representation of each variable (lines, bars and points)
- Change the color of each variable.
- Modify the y-axis margins.
- Remove areas, axes and variables.
- Add areas, axes and variables.
- Change the distribution of areas, axes and variables.
- Edit the background and text colour.
- Change the title of the graphic.

As can be seen in the previous window a schematic representation of the variables and their organization in areas and axes is shown. When the cursor is floated over this representation elements can be modified (i.e. variables, axes and areas) will be highlighted.



Select a variable, and click to change its properties

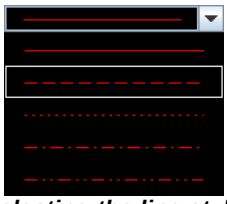
T change, for example, the representation properties of the phase 1 voltage variable, place the cursor here and left click.



Screen configuration of a variable representation

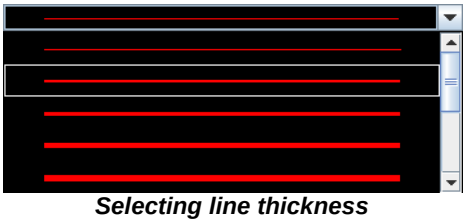
This screen permits configuration of the representation type (Lines, bars, or points), color, line style (only if the line type representation is selected), the dot style (only if the dot type of representation is selected) and the thickness of the line (only if the line type of representation is selected).

If the line type of representation is selected, there are five different style types to choose from: solid, dashed, dotted, dash –dot and dash-dot –dot.



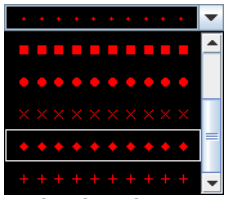
Selecting the line style

Line thickness may also be indicated.



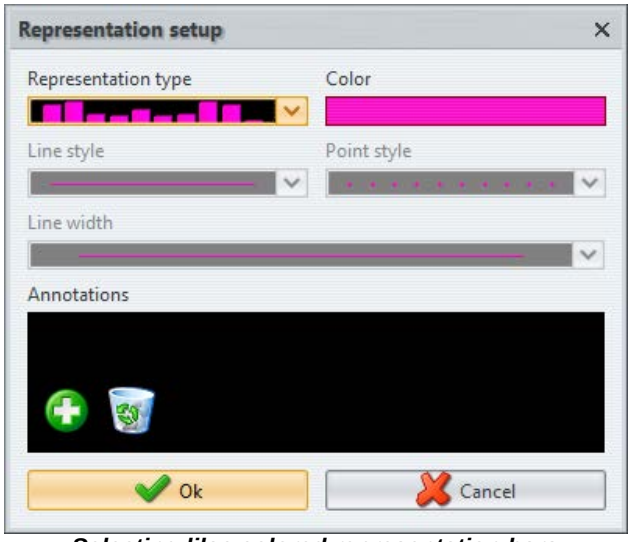
Selecting line thickness

If dots are selected, dot type may be indicated.



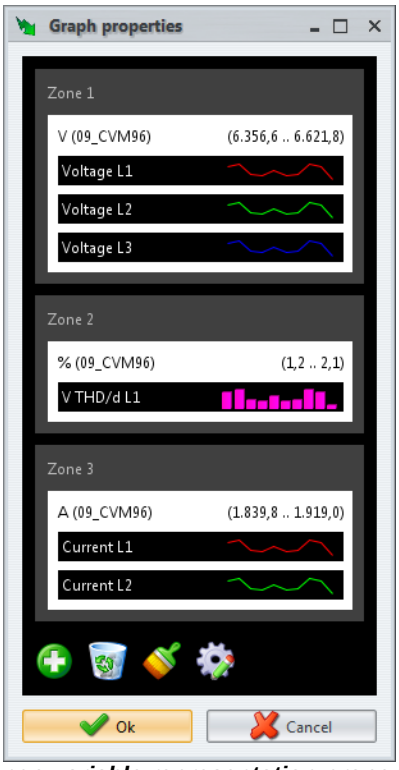
Selecting dot type

Suppose that the color is changed to a deep lilac. Note that it is possible to change the color for any kind of representation by left clicking on the color chart.



Selecting lilac colored representation bars

This selection will be reflected in the graph screen properties.



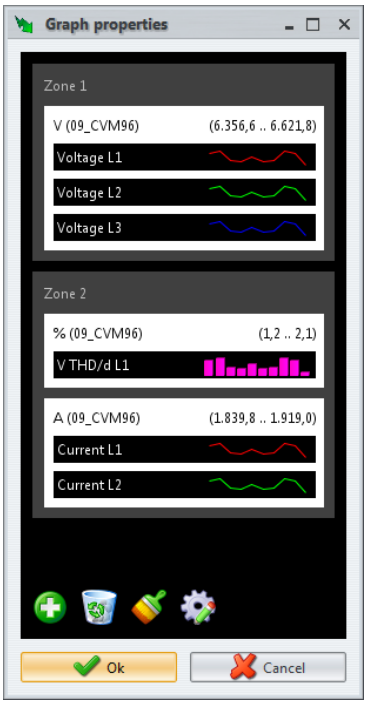
Change variable representation properties

A final property that can be changed on a variable is its position on the overall chart. To make this change simply drag the variable to a new location. While dragging the variable the positions where it can or cannot be "dropped" are indicated by red or green squares. Thus, a variable cannot be "dropped" on another variable (does not make sense) or on an axis (with a white background) with variable units different from the "dropped" variable. The variable may be "dropped" on any area (even on the same area but in another position), on an axis with the same unit type as the "dropped" variable (even within the same axis, but in another position) or "outside", i.e. between areas, above the first or below the last.

If the variable is "dropped" on an axis with the same unit type, it will be added to that variable in the order in which it was entered. The order in which they are placed is the order they are painted. Thus, the last variable of an axis is painted in the last place and will be displayed on top of the others (thus may hide them). It is often useful to place the variables represented by bars first, otherwise they will almost entirely hide the others.

A new axis will be created where the variable is "dropped". This new axis will share the drawing area with the other axes of the area, and all will be painted in the order they have been "dropped".

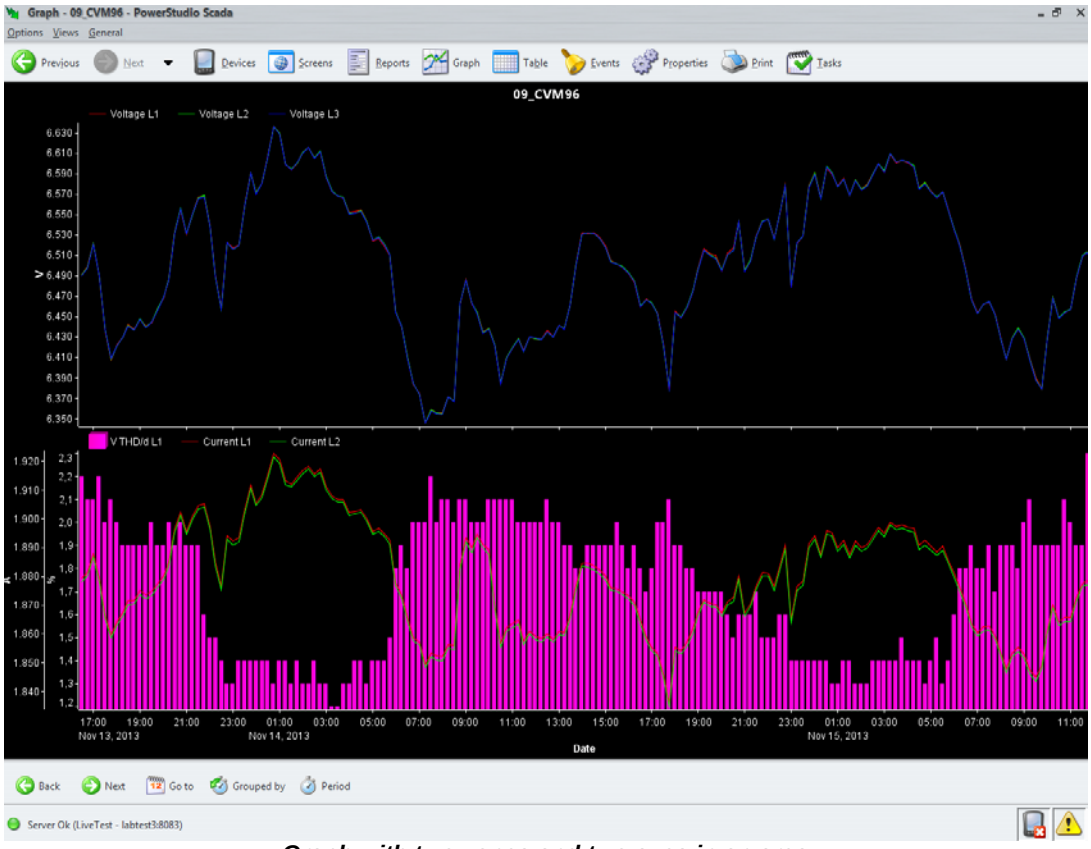
If the variable is "dropped" "outside" an area will be created with an axis in that position. Bear in mind that if the variable was the only one on the axis, that axis will be removed and if, moreover, that axis was the only one in the area, that area will be removed as well. The variable may also be "dropped" in the trash at the bottom of the graph properties screen; this action deletes it from the graph. In the example the distortion variable will be moved to the area where the currents are, at the top, so that it will be painted first.



Moving a variable to another area

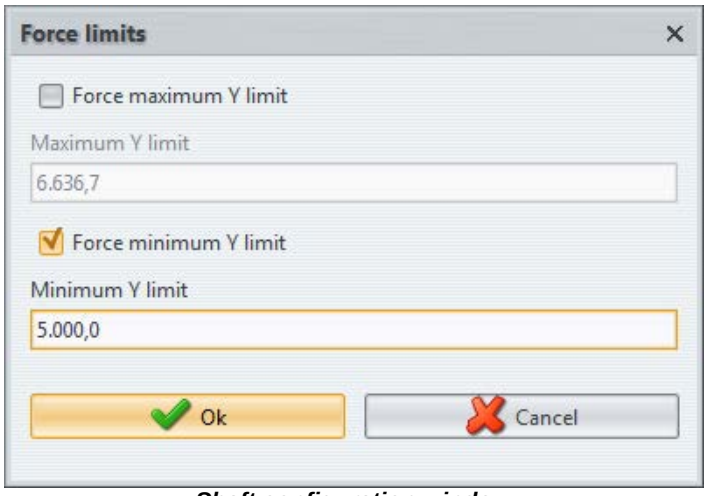
This way a new axis may be created within the area where the currents are found. Note that the area where the variable was found has disappeared and, therefore, now the graph contains two areas. Note also that in the second zone, the distortion axis (and thus the phase 1 distortion variable), are painted first, afterwards that of the current, first phase 1 and then phase 2.

This produces the following graph:


Graph - 09_CVM96 - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print Tasks
09_CVM96
Voltage L1 Voltage L2 Voltage L3
V
V THD/d L1 Current L1 Current L2
%
Nov 13, 2013
Nov 14, 2013
Nov 15, 2013
Date
Back Next Go to Grouped by Period
Server Ok (LiveTest - labtest3:8083)

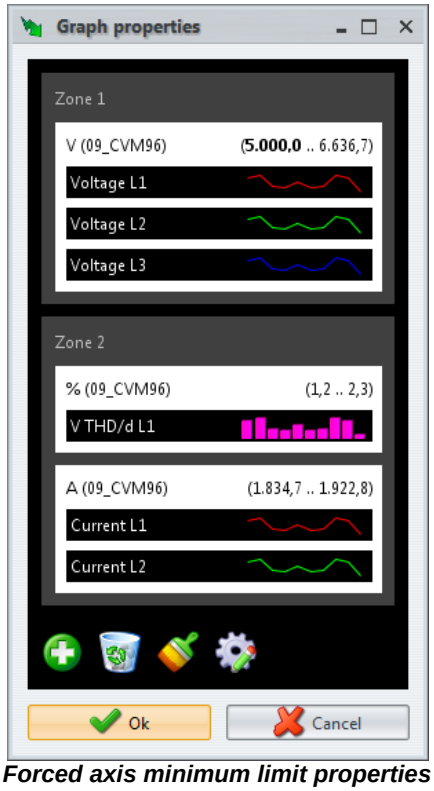
Graph with two zones and two axes in an area

The axes of a graph can also be configured using the properties window. In this window, click on the axis to be configured and the following window will appear:



Shaft configuration window

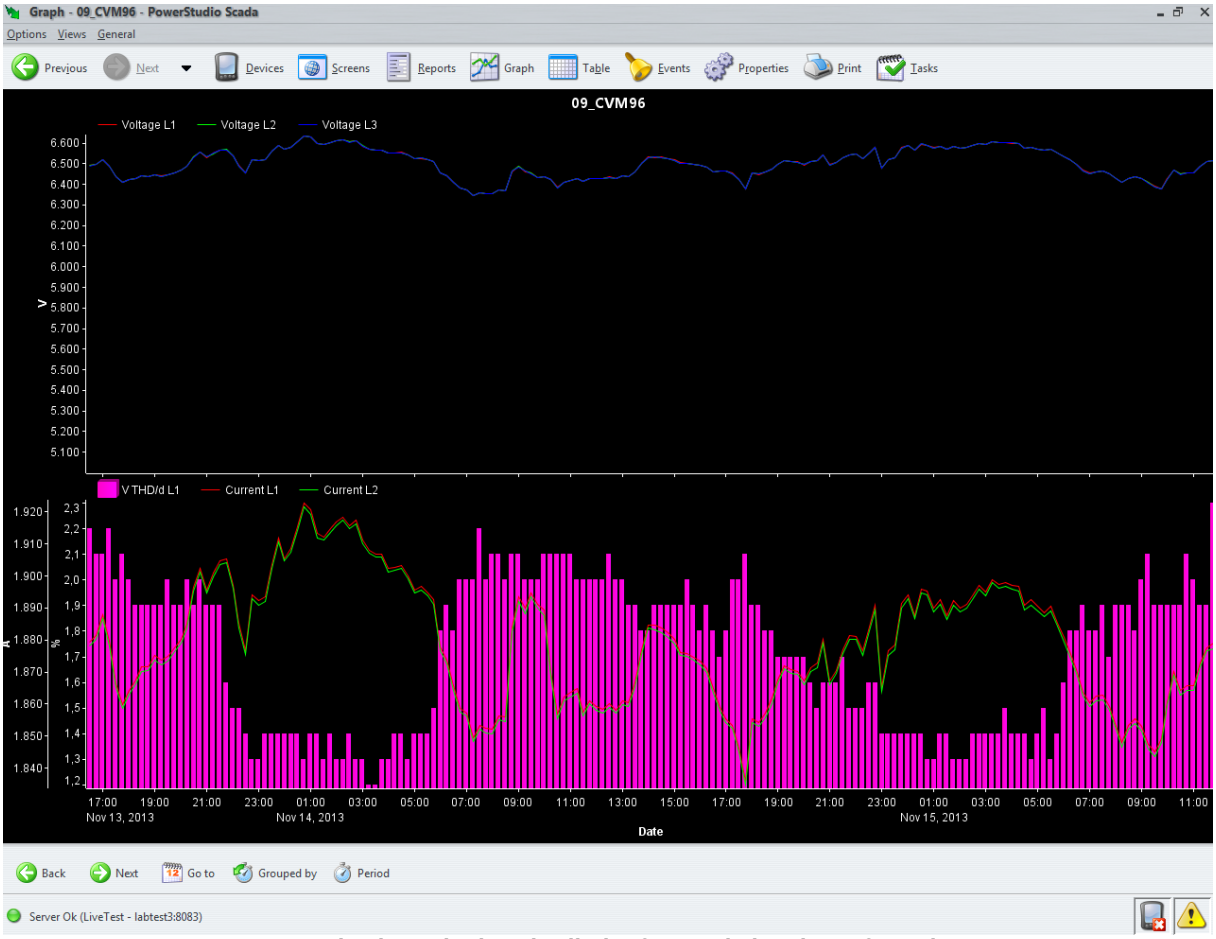
This window allows the limit values of the axis in its Y-coordinate to be set. By default the graphic engine set limits which enable all the values of a variable to be shown. However it is possible to modify them manually using this option. In the example the minimum Y limit value of the axis where the voltages of the phases are zero will be set.



Forced axis minimum limit properties

Note that in axis properties the units may be seen, as well as the equipment they belong to between parentheses (provided the variables are from only one device), and the Y-axis limits (minimum and maximum value, in bold if this value is forced by the user).

Like variables, axes can redistributed using the drag and drop method. The operation is the same as dragging and dropping a variable. So, one axis can be dropped on another with the same unit type, on another area (or on the same area but in another position), or "outside" in the trash (deleting all the variables it contains).


Graph - 09_CVM96 - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print Tasks
09_CVM96
Voltage L1 Voltage L2 Voltage L3
V
V THD/d L1 Current L1 Current L2
%
Nov 13, 2013
Nov 14, 2013
Nov 15, 2013
Date
Back Next Go to Grouped by Period
Server Ok (LiveTest - labtest3:8083)

Graph where the interior limit of a Y-axis has been forced

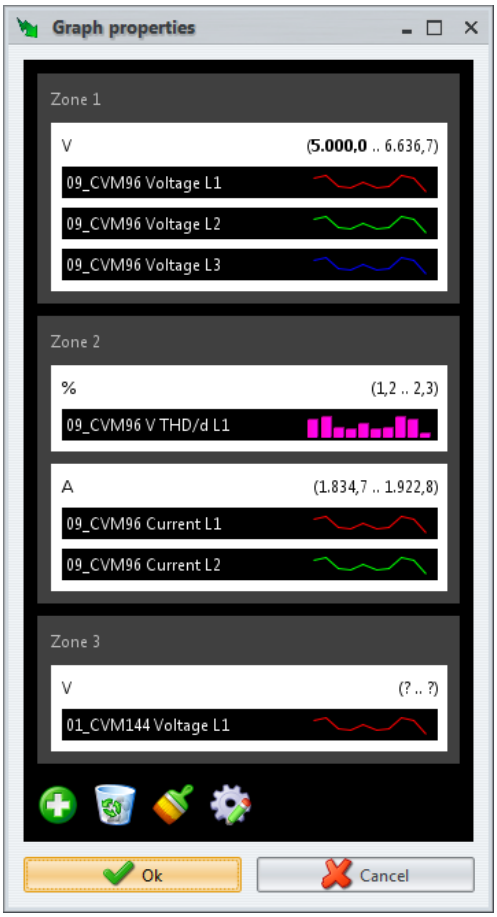
Finally, the only configuration of an area that may be changed is its position. So, like variables and axes, a zone can be dragged to another position, but only within another area, "outside" or to the trash (deleting all axes and variables that it contains).

Trash

One of the most interesting possibilities offered by the property screen is that of adding new variables to the chart. This is done by clicking on the button with the “+” sign, which is located on the lower left.

Add new variables to the graph

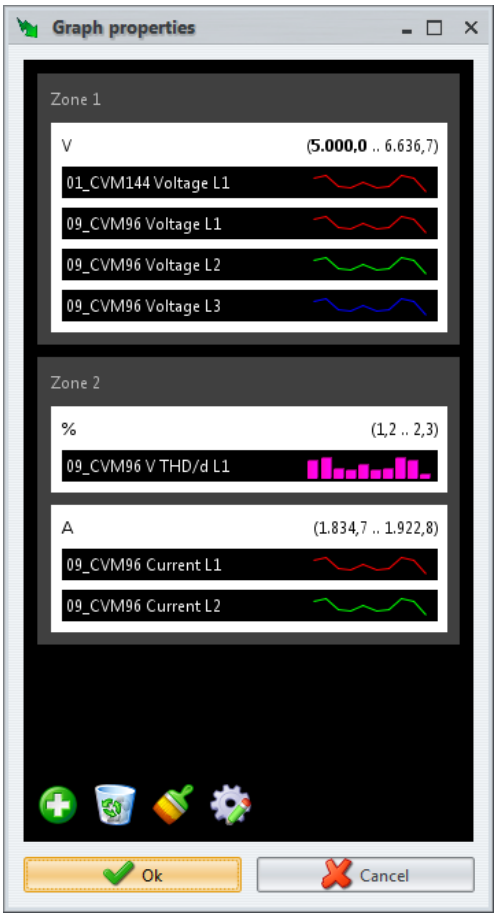
Equipment and variable selection windows will appear, allowing other variables to be added, including those from a different device. In the example a phase 1 voltage variable from other equipment has been added.



Adding a variable from another device

Note that the device information has disappeared from the axes and appears on each variable, because now there are no variables shown from one single device. The new variable (or new variables, if several were chosen) are organized into new areas at the end, and the limits of the new lines are unknown because they have not yet been loaded with data, although they may be forced by the user.

In the example the new variable was dragged onto the axis of the first zone and dropped on top of the axis, leaving the new variable as the first on the list. Note how the axis limits are inherited where they are released.



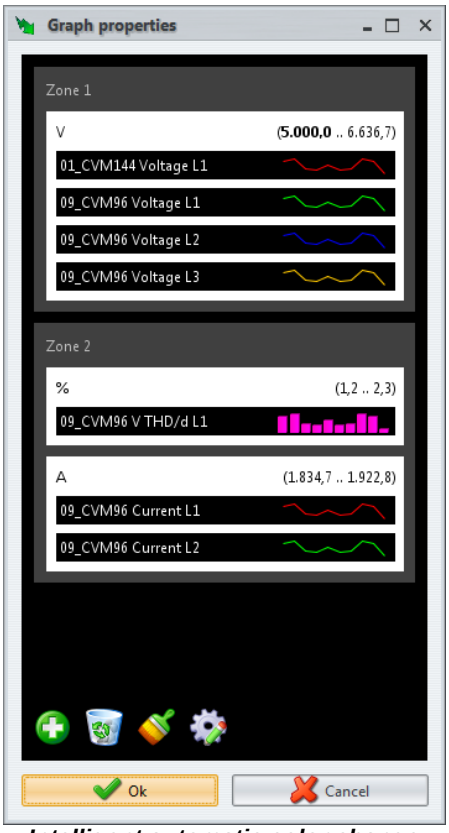
Variables of different devices on the same axis

Remember that dragging the variable to its new position leaves two variables on the same axis, in the same area, with the same color. This may be a problem for display.

There are two ways to solve the problem: the first is to change the color of the representation of one of the variables by hand, the second is to let the program decide the appropriate distribution of colors by itself. This latter is done by clicking on the button represented by a brush.

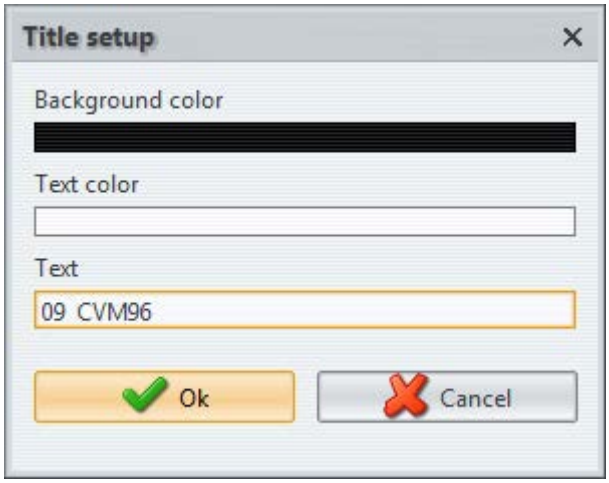
Intelligent distribution color brush

Clicking on this button lets the program decide whether or not there are any problems with displaying variable colors, and it will change the variables that it deems appropriate.



Intelligent automatic color change

Finalmente, si accedemos al último botón de configuración, podremos editar el título del gráfico, el color de fondo y el color del texto.



The resulting figure would be as follows:

Graph with variables from multiple devices

1.2.9.7 Printing a graph

The user can print the current graph page at any time using “print” in the “*Options*” menu of the main menu or the "Print" button of the upper toolbar. Note that this option, unlike that in the SCADA screens, is enabled for graphs.

1.2.9.8 Export graph

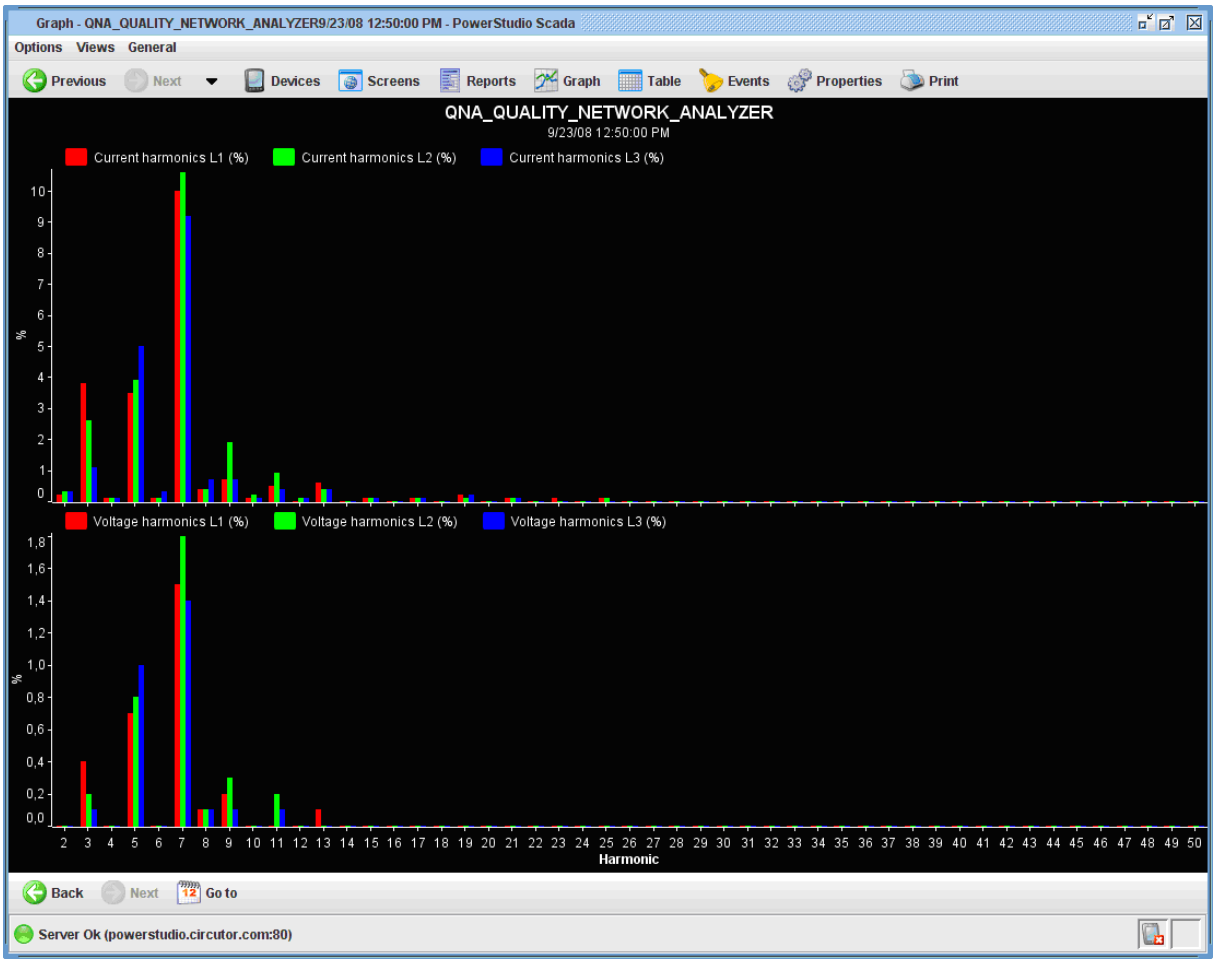
The user may at any time export the graph being viewed in a PNG format. This option should be accessed through “*Export*" in the “*Options*" menu of the main menu. Note that this option, unlike that in the SCADA screens, is enabled for graphs.

Note that graphs are exported with a white background to facilitate their inclusion in reports, studies, etc.

1.2.9.9 Graph types

So far we have seen standard graph types, i.e. graphs comprising a number of areas, where each zone has an X-axis, which is a time interval and a Y-axis for variable values. However, there are certain types of graphs that have distinct characteristics.

A harmonics graph would be a special graph. This chart is provided by equipment that calculates harmonics variables, whether voltage or current. This type of graph may be found on QNA equipment, for example, among others, and can show harmonic distortion for voltage as well as current in each phase.



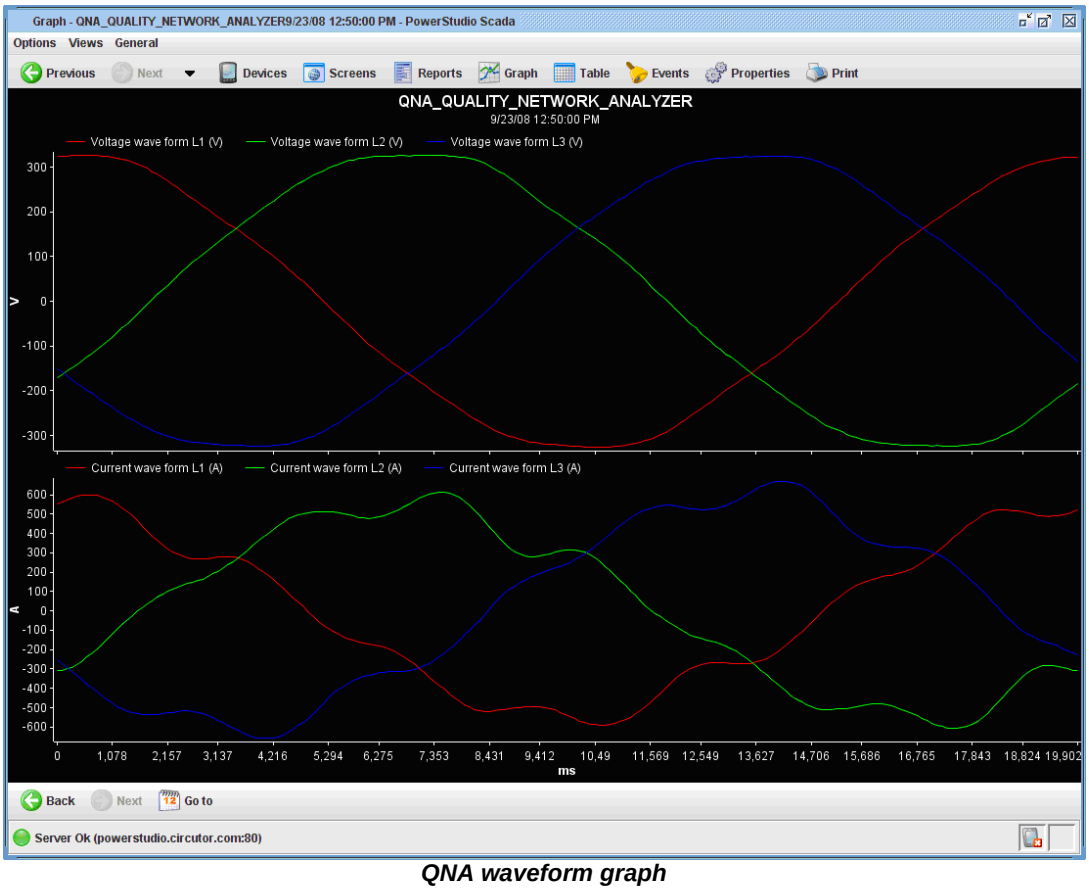
Harmonics graph

This type of graph has some special features:

- ***Subtitle:*** In the caption under the graph title, the date of the harmonic distortion being displayed is indicated.
- ***X-axis:*** The X- axis does not represent time, but rather the harmonic number. It therefore lacks units.
- ***Toolbar:*** The toolbar contains only 3 buttons to display other records, earlier records may be displayed, or later ones, or those closest to a date specified by the user ("*Go to*" option).
- ***Properties:*** The configurable properties of this type of graph are the same as with a standard graph, the only difference being that only variables from equipment containing this type of variable are available.
- ***Representation using bars:*** Sets default representation to bars, as a special feature, but these can be reconfigured later.

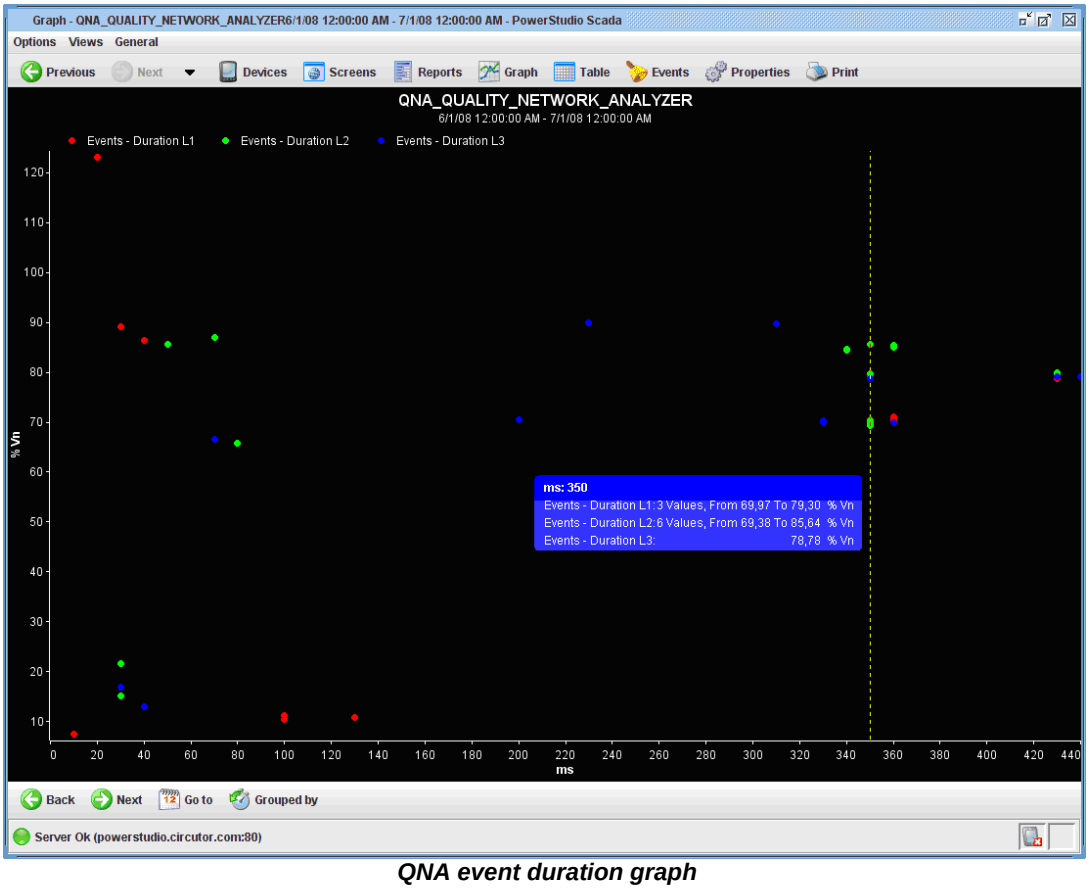
Another special feature graph is the waveform graph, generated by QNA equipment, which can provide a screenshot of the voltage waveform as well as the current in each one of the phases.

The characteristics of this graph are very similar to the harmonics graph. The only differences are that the X-axis units are milliseconds and that the representation is in lines by default. Only waveform variables may be added to this type of graph.


Graph - QNA_QUALITY_NETWORK_ANALYZER9/23/08 12:50:00 PM - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
QNA_QUALITY_NETWORK_ANALYZER
9/23/08 12:50:00 PM
Voltage wave form L1 (V)
Voltage wave form L2 (V)
Voltage wave form L3 (V)
V
Current wave form L1 (A)
Current wave form L2 (A)
Current wave form L3 (A)
A
ms
Back Next Go to
Server Ok (powerstudio.circutor.com:80)

QNA waveform graph

Another special graph is the event duration graph

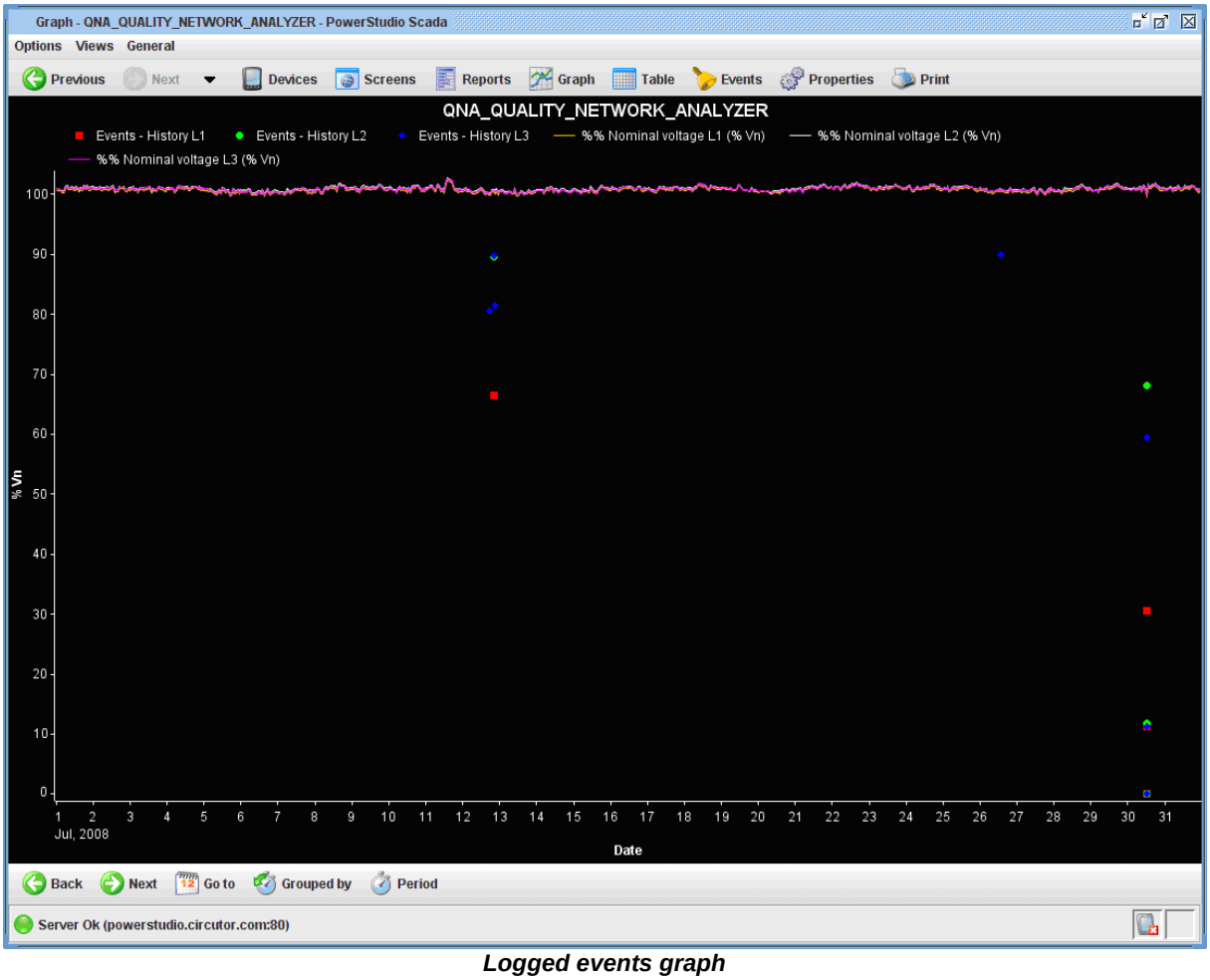

Graph - QNA_QUALITY_NETWORK_ANALYZER6/1/08 12:00:00 AM - 7/1/08 12:00:00 AM - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
QNA_QUALITY_NETWORK_ANALYZER
6/1/08 12:00:00 AM - 7/1/08 12:00:00 AM
Events - Duration L1
Events - Duration L2
Events - Duration L3
% Vn
ms: 350
Events - Duration L1:3 Values, From 69,97 To 79,30 % Vn
Events - Duration L2:6 Values, From 69,38 To 85,64 % Vn
Events - Duration L3: 78,78 % Vn
ms
Back Next Go to Grouped by
Server Ok (powerstudio.circutor.com:80)

QNA event duration graph

This type of graph represents the voltage events registered during a period of time, organized according to their duration. This graph has some special features:

- ***X-axis:*** The X-axis represents the duration in milliseconds.
- ***Representation Interval:*** The events of a user defined time interval are represented.
- ***Toolbar:*** The toolbar may be used to move through time intervals, as well as define a new time interval, either pre-defined or fully configurable by the user.
- ***Representation:*** The default representation is dots, although it can be changed at will.
- ***Tooltip:*** It is typical to see in such a figure a special tooltip indicating the number of values of the variable that exist at this point, and between which values it can be found, as it is normal that many values are repeated with certain duration.
- ***Subtitle:*** Unlike the harmonics and waveform graph, the subtitle here indicates the time interval displayed.
- ***Adding new variables:*** Only variables of the type being viewed can be added, (i.e., duration of events).

Another unusual graph is that of logged events.

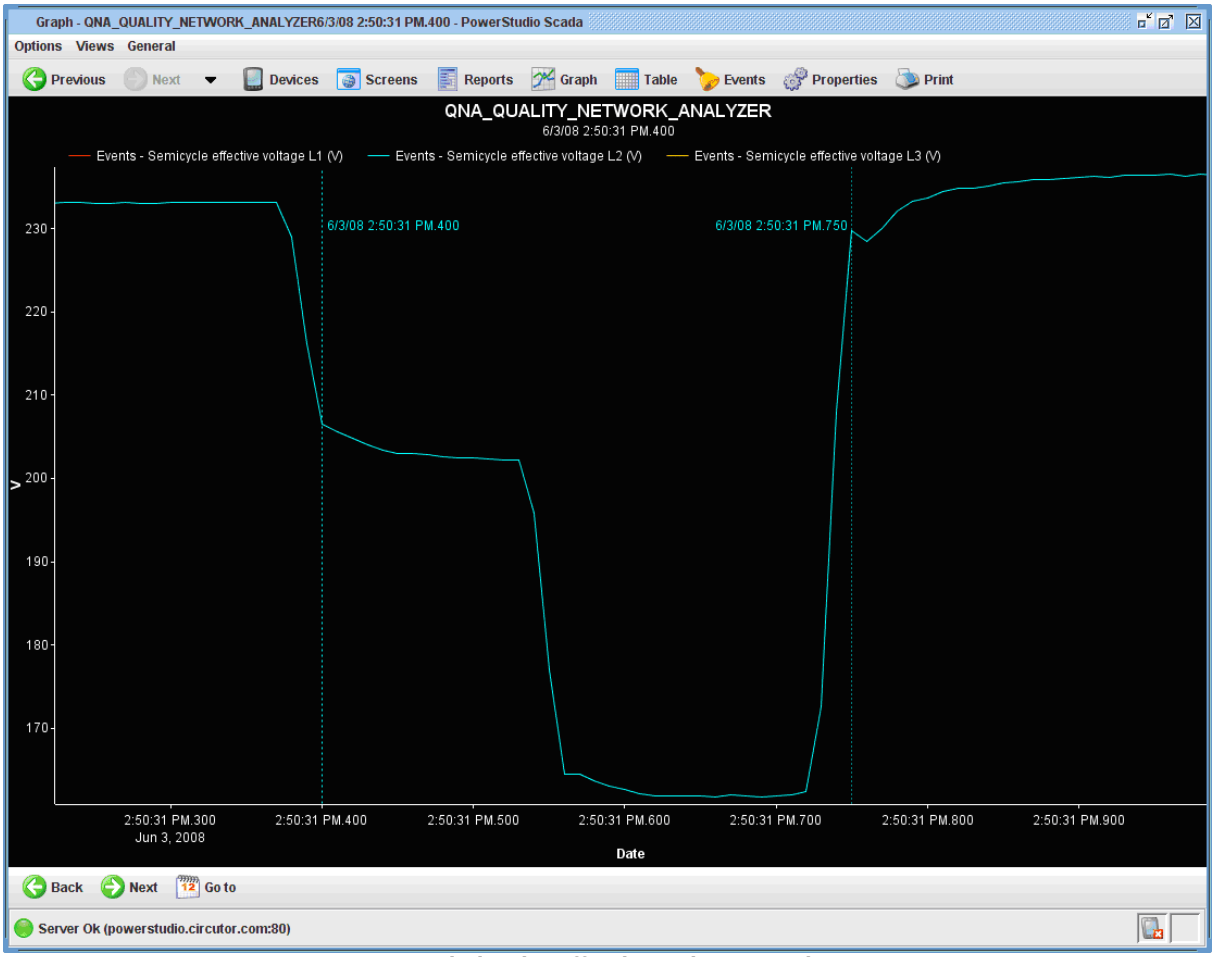

Graph - QNA_QUALITY_NETWORK_ANALYZER - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
QNA_QUALITY_NETWORK_ANALYZER
Events - History L1
Events - History L2
Events - History L3
%% Nominal voltage L1 (% Vn)
%% Nominal voltage L2 (% Vn)
%% Nominal voltage L3 (% Vn)
% Vn
Jul, 2008
Date
Back Next Go to Grouped by Period
Server Ok (powerstudio.circutor.com:80)

Logged events graph

This figure is essentially equivalent to a standard graph, with all the same characteristics. The only difference is that each event is depicted as a dot plus a horizontal line whose length equals the duration of the event represented.

Usually the values of events this graph shows are accompanied by nominal voltage. In both cases the units are expressed as a percentage of the nominal value. Any other standard variable may also be added.

The last special type of graph is the semi-circular effective voltage graph.



Semi-circular effective voltage graph

This type of graph represents voltage evolution within a short space of time in semi-circular intervals. These screenshots are made in response to an event capture at that moment.

Very similar to the waveform graph, the only difference being that the x-axis consists of dates as in a standard graph, as the semi-cycle value capture takes place just at that moment.

1.2.10 Making tables

Another important client tool is the ability to make variable value tables for a piece of equipment. Access this view using the "*Views*" menu option, then "*Studio*" and finally "*Table*" or directly from the "*Table*" button in the toolbar. Tables may be created from a predefined SCADA screen, where a control table has been added, or from buttons defined for this purpose in the monitoring view of a device (for example, a QNA monitoring view).

Typically, to make a table it is necessary to choose what variables from which devices will be part of it. The selection of these variables is done in the same manner as for generating a graph. Selection produces a table like this:

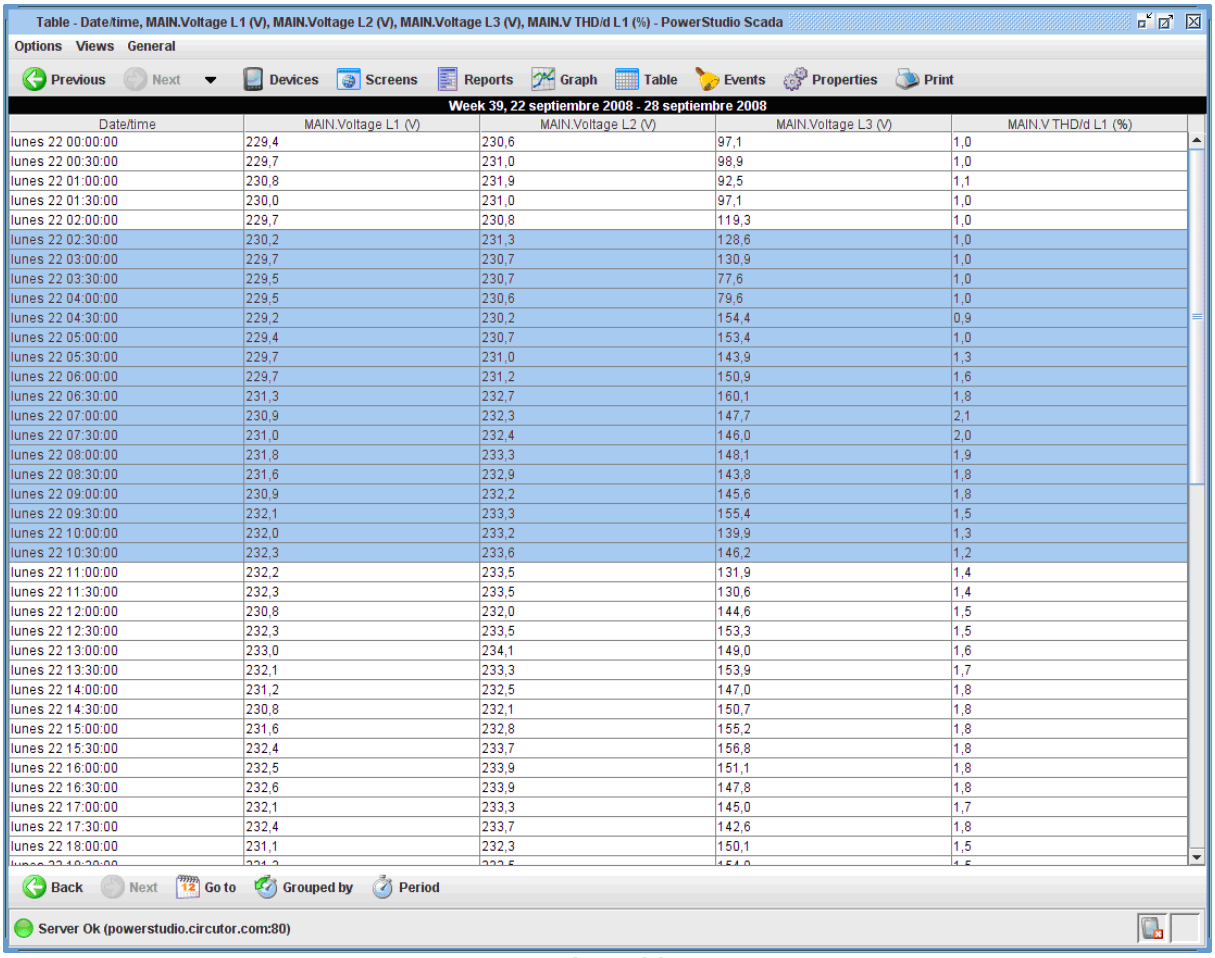


Table - Date/time, MAIN.Voltage L1 (V), MAIN.Voltage L2 (V), MAIN.Voltage L3 (V), MAIN.V THD/d L1 (%) - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
Week 39, 22 septiembre 2008 - 28 septiembre 2008
Back Next Go to Grouped by Period
Server Ok (powerstudio.circutor.com:80)

Date/time	MAIN.Voltage L1 (V)	MAIN.Voltage L2 (V)	MAIN.Voltage L3 (V)	MAIN.V THD/d L1 (%)
lunes 22 00:00:00	229,4	230,6	97,1	1,0
lunes 22 00:30:00	229,7	231,0	98,9	1,0
lunes 22 01:00:00	230,8	231,9	92,5	1,1
lunes 22 01:30:00	230,0	231,0	97,1	1,0
lunes 22 02:00:00	229,7	230,8	119,3	1,0
lunes 22 02:30:00	230,2	231,3	128,6	1,0
lunes 22 03:00:00	229,7	230,7	130,9	1,0
lunes 22 03:30:00	229,5	230,7	77,6	1,0
lunes 22 04:00:00	229,5	230,6	79,6	1,0
lunes 22 04:30:00	229,2	230,2	154,4	0,9
lunes 22 05:00:00	229,4	230,7	153,4	1,0
lunes 22 05:30:00	229,7	231,0	143,9	1,3
lunes 22 06:00:00	229,7	231,2	150,9	1,6
lunes 22 06:30:00	231,3	232,7	160,1	1,8
lunes 22 07:00:00	230,9	232,3	147,7	2,1
lunes 22 07:30:00	231,0	232,4	146,0	2,0
lunes 22 08:00:00	231,8	233,3	148,1	1,9
lunes 22 08:30:00	231,6	232,9	143,8	1,8
lunes 22 09:00:00	230,9	232,2	145,6	1,8
lunes 22 09:30:00	232,1	233,3	155,4	1,5
lunes 22 10:00:00	232,0	233,2	139,9	1,3
lunes 22 10:30:00	232,3	233,6	146,2	1,2
lunes 22 11:00:00	232,2	233,5	131,9	1,4
lunes 22 11:30:00	232,3	233,5	130,6	1,4
lunes 22 12:00:00	230,8	232,0	144,6	1,5
lunes 22 12:30:00	232,3	233,5	153,3	1,5
lunes 22 13:00:00	233,0	234,1	149,0	1,6
lunes 22 13:30:00	232,1	233,3	153,9	1,7
lunes 22 14:00:00	231,2	232,5	147,0	1,8
lunes 22 14:30:00	230,8	232,1	150,7	1,8
lunes 22 15:00:00	231,6	232,8	155,2	1,8
lunes 22 15:30:00	232,4	233,7	156,8	1,8
lunes 22 16:00:00	232,5	233,9	151,1	1,8
lunes 22 16:30:00	232,6	233,9	147,8	1,8
lunes 22 17:00:00	232,1	233,3	145,0	1,7
lunes 22 17:30:00	232,4	233,7	142,6	1,8
lunes 22 18:00:00	231,1	232,3	150,1	1,5

Value table

Note that the typical value table consists of three parts:

- ***Title:*** This usually indicates what data period is displayed, although in special tables it may contain other information.
- ***Body:*** This contains a series of columns with the values each variable has in each register. Each column is a variable and contains a header with the same title.
- ***Toolbar:*** As in the graph, the grouping and the displayed data period can be configured.

There is a direct equivalence between the tables and graphs, in other words, the same type of graph and table show the same values but in different formats and, obviously, with different configuration capacities.

This feature is used by the PowerStudio client to deduce what graph or table to create when on a graph or table display. That is, if a chart is displayed and client table button is clicked, PowerStudio will deduce that a table of the variables represented in the graph is desired, and will immediately

display it. Likewise, if a table is displayed and the graph button is clicked, PowerStudio client will deduce that a graph of the variables shown on the table is desired.

The operation of the toolbar is absolutely the same as the operation of the same bar on the graph view.

It is possible to configure some aspects using the table "*Properties*" option. This option can be accessed using the "*Options*" menu, "*Properties*" submenu, or directly with the "*Properties*" button on the main toolbar.

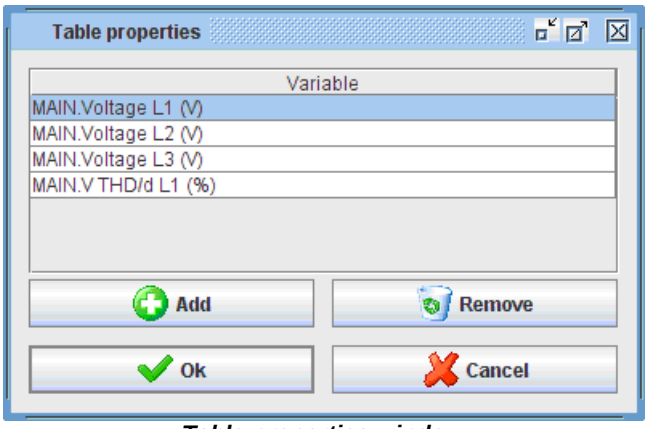


Table properties window

Use this window to add new variables to the table in the same way as they are added to the graph, by clicking on "*Add*". It is also possible to delete variables from the table, simply by selecting the desired variables and clicking on the "*Delete*" button.

As with the graphs, the user can print the current graph page at any time using the "*Print*" option in the "*Options*" menu of the main menu or the "*Print*" button of the upper toolbar. Note that this option, unlike that in the SCADA screens, is enabled for tables.

It is also possible to export this table by clicking "*Export*" in the "*Options*" menu of the main menu. It will be exported in text format, where each line of text is a row of the table and where each column is separated by the symbol ";".

A common feature in all tables is that they can be sorted by columns by clicking on them. By default, tables usually appear sorted by date, usually the first column, but they can be ordered by other variables. Clicking on the title of a column will place it in ascending order, clicking again on the same place set it in descending order, and a third click will bring it back to its original format.

It is also possible to order a column so that a second column can later be ordered based upon the first. For example, for a column representing a category type pertaining to each row, and another representing a numerical value associated with each row, the category column may be ordered first by clicking on its title, and afterwards, while holding the "CTRL" key, click the magnitude column (once for ascending order or twice for descending order). This will order the table by group, and within each group, by size.

QNA equipment allows a special table to be made called "*Events*" that lets you view a list of events recorded by the equipment. This table can only be viewed from the corresponding button on the equipment monitoring screen and does not correspond with any graph view.

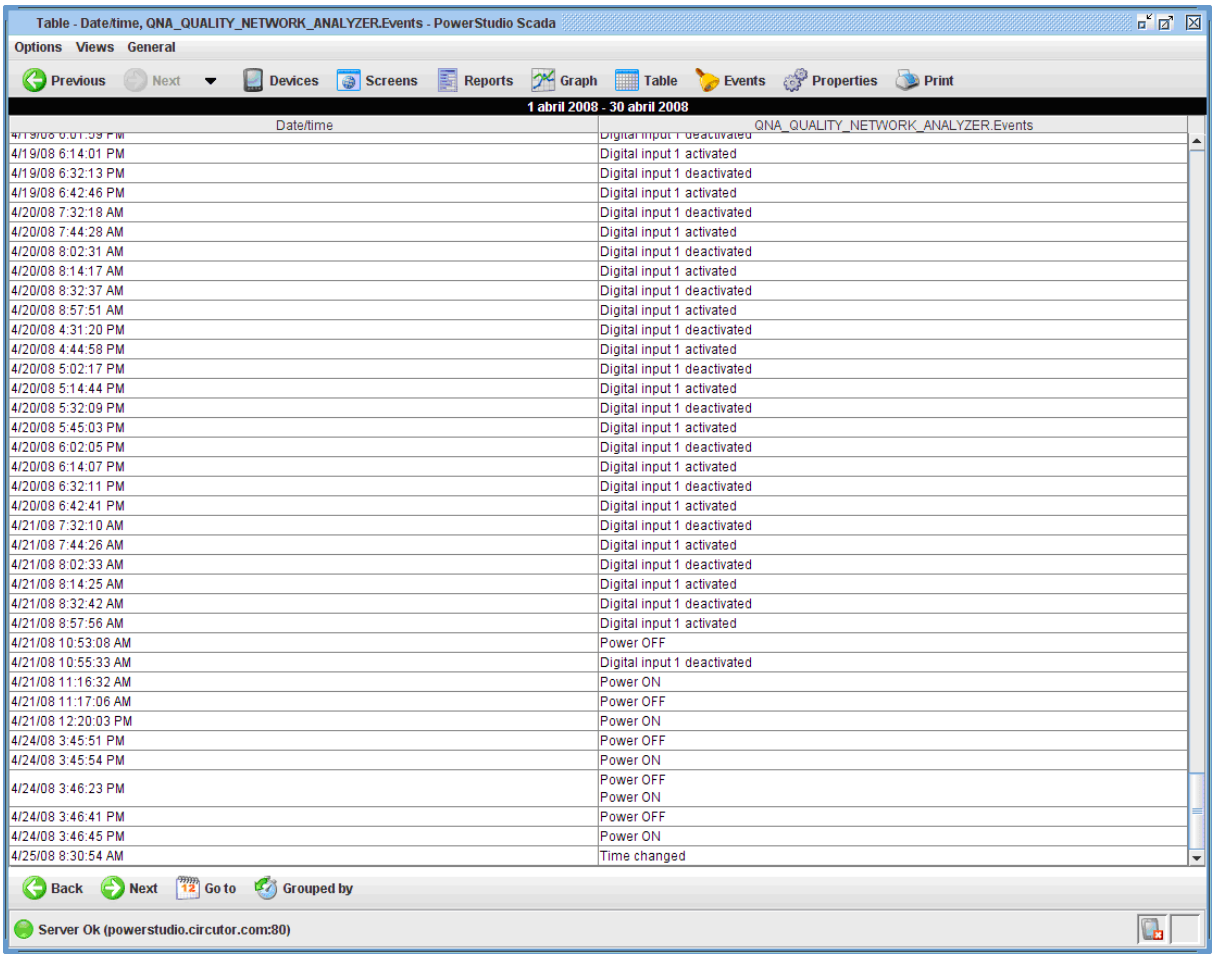


Table - Date/time, QNA_QUALITY_NETWORK_ANALYZER.Events - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
1 abril 2008 - 30 abril 2008
Date/time
QNA_QUALITY_NETWORK_ANALYZER.Events
4/19/08 6:14:01 PM Digital input 1 activated
4/19/08 6:32:13 PM Digital input 1 deactivated
4/19/08 6:42:46 PM Digital input 1 activated
4/20/08 7:32:18 AM Digital input 1 deactivated
4/20/08 7:44:28 AM Digital input 1 activated
4/20/08 8:02:31 AM Digital input 1 deactivated
4/20/08 8:14:17 AM Digital input 1 activated
4/20/08 8:32:37 AM Digital input 1 deactivated
4/20/08 8:57:51 AM Digital input 1 activated
4/20/08 4:31:20 PM Digital input 1 deactivated
4/20/08 4:44:58 PM Digital input 1 activated
4/20/08 5:02:17 PM Digital input 1 deactivated
4/20/08 5:14:44 PM Digital input 1 activated
4/20/08 5:32:09 PM Digital input 1 deactivated
4/20/08 5:45:03 PM Digital input 1 activated
4/20/08 6:02:05 PM Digital input 1 deactivated
4/20/08 6:14:07 PM Digital input 1 activated
4/20/08 6:32:11 PM Digital input 1 deactivated
4/20/08 6:42:41 PM Digital input 1 activated
4/21/08 7:32:10 AM Digital input 1 deactivated
4/21/08 7:44:26 AM Digital input 1 activated
4/21/08 8:02:33 AM Digital input 1 deactivated
4/21/08 8:14:25 AM Digital input 1 activated
4/21/08 8:32:42 AM Digital input 1 deactivated
4/21/08 8:57:56 AM Digital input 1 activated
4/21/08 10:53:08 AM Power OFF
4/21/08 10:55:33 AM Digital input 1 deactivated
4/21/08 11:16:32 AM Power ON
4/21/08 11:17:06 AM Power OFF
4/21/08 12:20:03 PM Power ON
4/24/08 3:45:51 PM Power OFF
4/24/08 3:45:54 PM Power ON
4/24/08 3:46:23 PM Power OFF Power ON
4/24/08 3:46:41 PM Power OFF
4/24/08 3:46:45 PM Power ON
4/25/08 8:30:54 AM Time changed
Back Next Go to Grouped by
Server Ok (powerstudio.circutor.com:80)

QNA events timetable

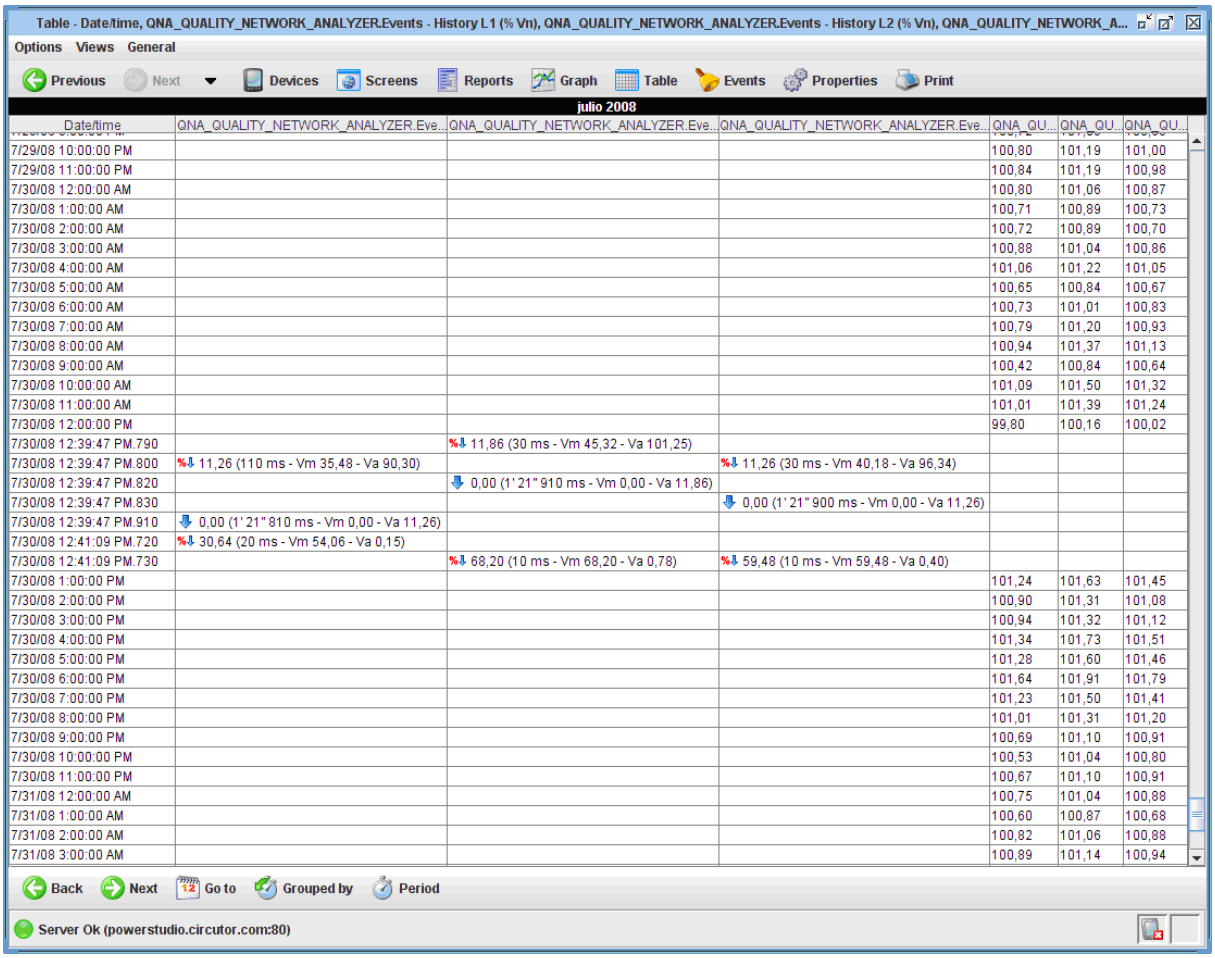
The table has two columns: the first is the date and time when the incident occurred, and the second is its description.

As you can see, this table does not allow the properties of the screen to be changed, nor the variable period (which would not, on the other hand, make any sense). However it is possible to print it in same way as other tables.

Special graphs have their equivalent table, and therefore we have table equivalents for harmonics graphs, waveforms, logged events, duration of events and effective voltage semi-cycle events.

The logged events table is peculiar in that for every event a great deal of information may be displayed:

- ***Event Type:*** An icon at the beginning of the report will indicate whether it is a gap, an interruption or an overvoltage.
- ***Value of the event:*** Indicates the most representative event value. In the case of an overvoltage this value is the highest registered by the event, in other cases it is the minimum value reached. It is expressed as a percentage of the nominal voltage.
- ***Duration:*** The first value in brackets indicates the duration of the event.
- ***Average voltage:*** Indicates average voltage of the event, expressed as a percentage of the nominal voltage.
- ***Previous Voltage:*** Indicates the voltage present at the beginning of the event, expressed as a percentage of the voltage.



Events history table

The events duration table displays a list wherein the first column contains the duration of events in the interval shown. Aside from the duration in itself, it shows the number of events in the interval with the same duration (irrespective of the phase). In each variable column the number of events from that phase is indicated and between brackets the event value (if there is more than one event in this phase with equal duration, the minimum and maximum value of the events of the same duration in this phase are indicated).

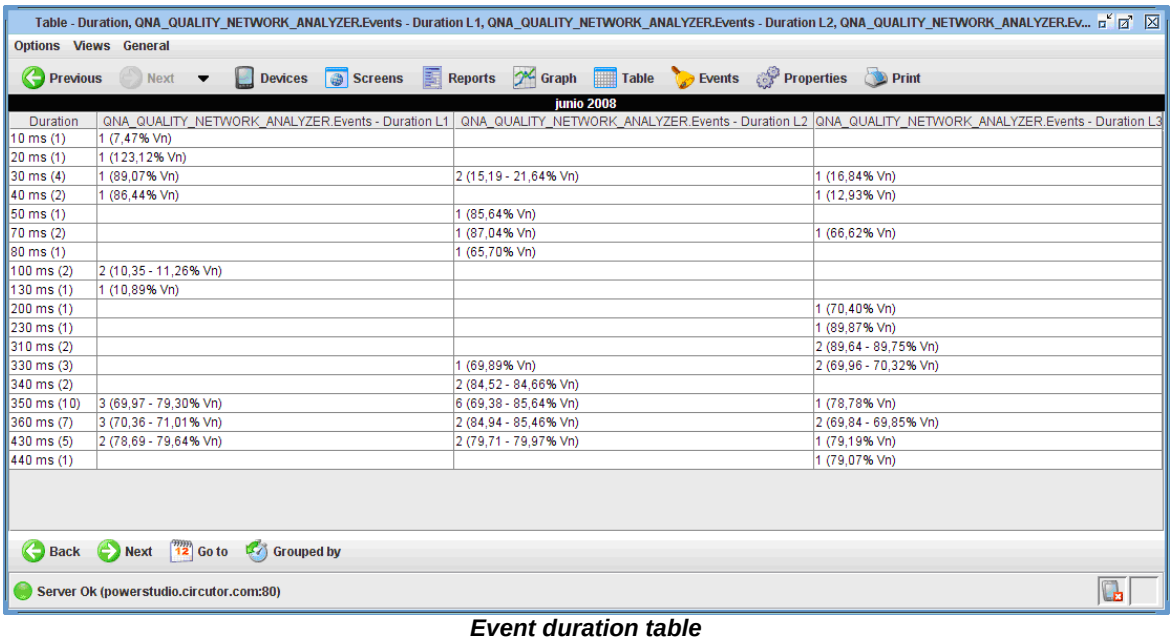


Table - Duration, QNA_QUALITY_NETWORK_ANALYZER.Events - Duration L1, QNA_QUALITY_NETWORK_ANALYZER.Events - Duration L2, QNA_QUALITY_NETWORK_ANALYZER.Ev...
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
junio 2008
Duration | QNA_QUALITY_NETWORK_ANALYZER.Events - Duration L1 | QNA_QUALITY_NETWORK_ANALYZER.Events - Duration L2 | QNA_QUALITY_NETWORK_ANALYZER.Events - Duration L3
10 ms (1) | 1 (7,47% Vn) | |
20 ms (1) | 1 (123,12% Vn) | |
30 ms (4) | 1 (89,07% Vn) | 2 (15,19 - 21,64% Vn) | 1 (16,84% Vn)
40 ms (2) | 1 (86,44% Vn) | | 1 (12,93% Vn)
50 ms (1) | | 1 (85,64% Vn) |
70 ms (2) | | 1 (87,04% Vn) | 1 (66,62% Vn)
80 ms (1) | | 1 (65,70% Vn) |
100 ms (2) | 2 (10,35 - 11,26% Vn) | |
130 ms (1) | 1 (10,89% Vn) | |
200 ms (1) | | | 1 (70,40% Vn)
230 ms (1) | | | 1 (89,87% Vn)
310 ms (2) | | | 2 (89,64 - 89,75% Vn)
330 ms (3) | | 1 (69,89% Vn) | 2 (69,96 - 70,32% Vn)
340 ms (2) | | 2 (84,52 - 84,66% Vn) |
350 ms (10) | 3 (69,97 - 79,30% Vn) | 6 (69,38 - 85,64% Vn) | 1 (78,78% Vn)
360 ms (7) | 3 (70,36 - 71,01% Vn) | 2 (84,94 - 85,46% Vn) | 2 (69,84 - 69,85% Vn)
430 ms (5) | 2 (78,69 - 79,64% Vn) | 2 (79,71 - 79,97% Vn) | 1 (79,19% Vn)
440 ms (1) | | | 1 (79,07% Vn)
Back Next Go to Grouped by
Server Ok (powerstudio.circutor.com:80)

Event duration table

Harmonic tables and waveforms show the same information as the equivalent graph but as a list. However, the effective semi-cycle voltage table shows more information.

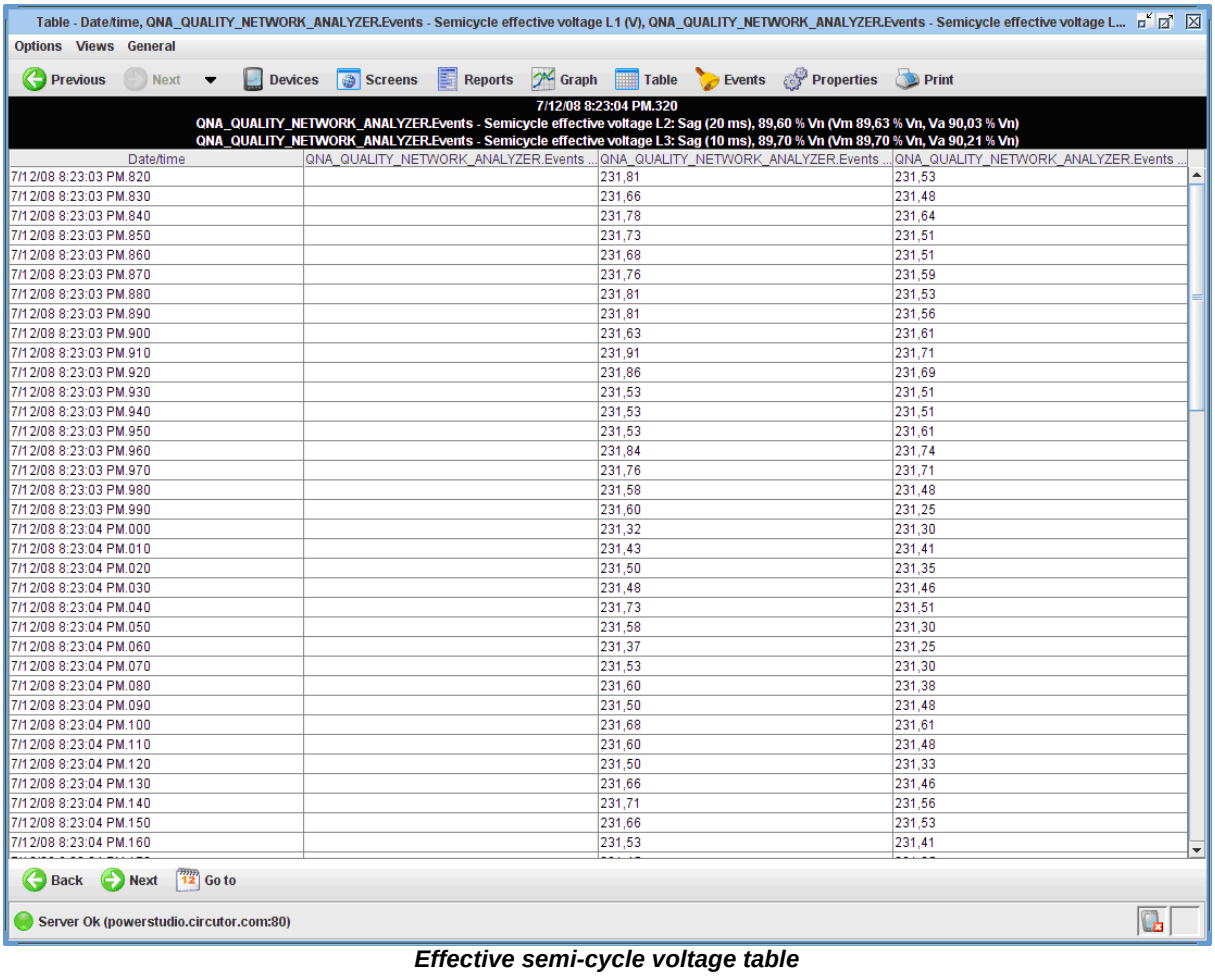


Table - Date/time, QNA_QUALITY_NETWORK_ANALYZER.Events - Semicycle effective voltage L1 (V), QNA_QUALITY_NETWORK_ANALYZER.Events - Semicycle effective voltage L...
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
7/12/08 8:23:04 PM.320
QNA_QUALITY_NETWORK_ANALYZER.Events - Semicycle effective voltage L2: Sag (20 ms), 89,60 % Vn (Vm 89,63 % Vn, Va 90,03 % Vn)
QNA_QUALITY_NETWORK_ANALYZER.Events - Semicycle effective voltage L3: Sag (10 ms), 89,70 % Vn (Vm 89,70 % Vn, Va 90,21 % Vn)
Back Next Go to
Server Ok (powerstudio.circutor.com:80)

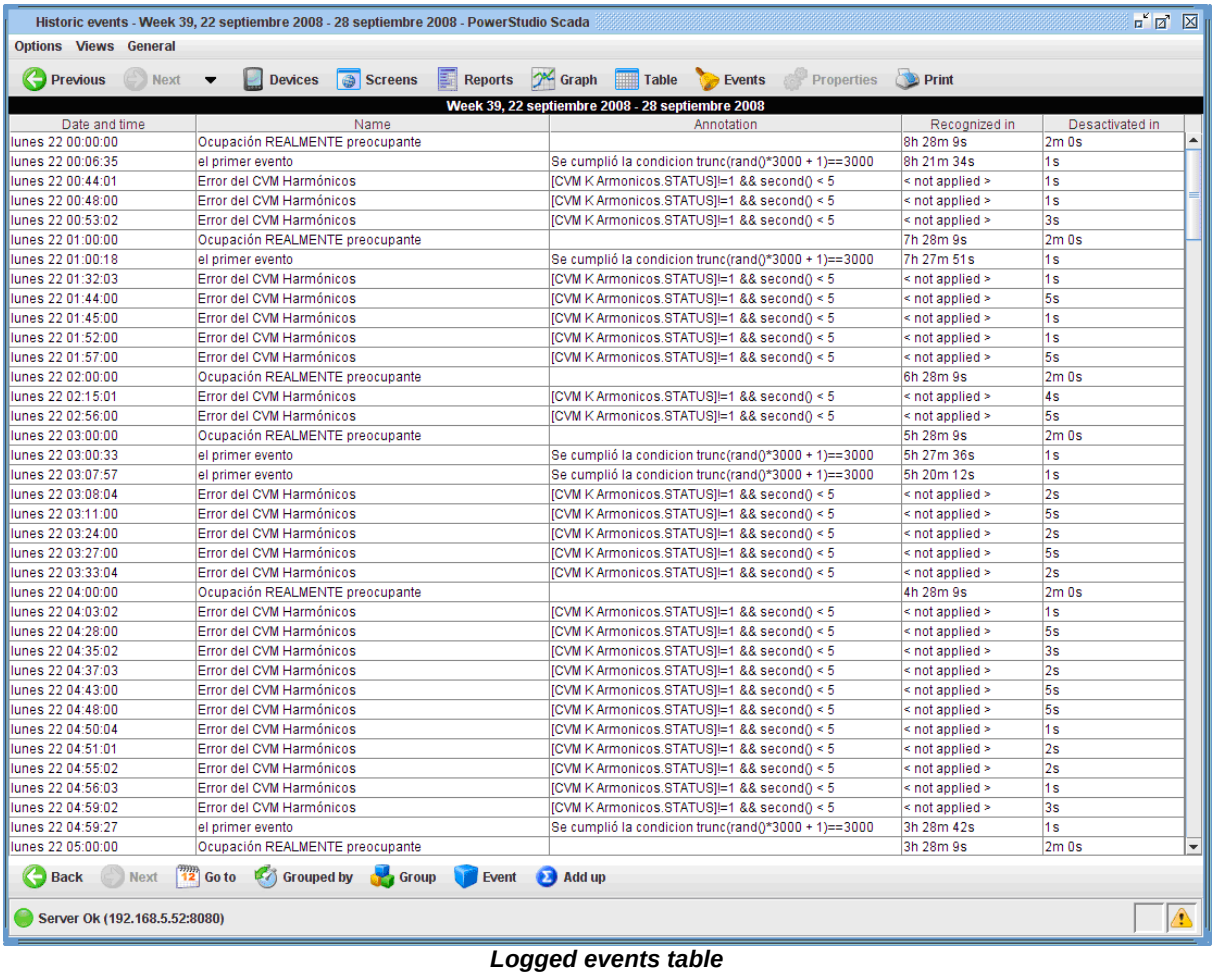
Date/time	QNA_QUALITY_NETWORK_ANALYZER.Events ...	QNA_QUALITY_NETWORK_ANALYZER.Events ...	QNA_QUALITY_NETWORK_ANALYZER.Events ...
7/12/08 8:23:03 PM.820		231,81	231,53
7/12/08 8:23:03 PM.830		231,66	231,48
7/12/08 8:23:03 PM.840		231,78	231,64
7/12/08 8:23:03 PM.850		231,73	231,51
7/12/08 8:23:03 PM.860		231,68	231,51
7/12/08 8:23:03 PM.870		231,76	231,59
7/12/08 8:23:03 PM.880		231,81	231,53
7/12/08 8:23:03 PM.890		231,81	231,56
7/12/08 8:23:03 PM.900		231,63	231,61
7/12/08 8:23:03 PM.910		231,91	231,71
7/12/08 8:23:03 PM.920		231,86	231,69
7/12/08 8:23:03 PM.930		231,53	231,51
7/12/08 8:23:03 PM.940		231,53	231,51
7/12/08 8:23:03 PM.950		231,53	231,61
7/12/08 8:23:03 PM.960		231,84	231,74
7/12/08 8:23:03 PM.970		231,76	231,71
7/12/08 8:23:03 PM.980		231,58	231,48
7/12/08 8:23:03 PM.990		231,60	231,25
7/12/08 8:23:04 PM.000		231,32	231,30
7/12/08 8:23:04 PM.010		231,43	231,41
7/12/08 8:23:04 PM.020		231,50	231,35
7/12/08 8:23:04 PM.030		231,48	231,46
7/12/08 8:23:04 PM.040		231,73	231,51
7/12/08 8:23:04 PM.050		231,58	231,30
7/12/08 8:23:04 PM.060		231,37	231,25
7/12/08 8:23:04 PM.070		231,53	231,30
7/12/08 8:23:04 PM.080		231,60	231,38
7/12/08 8:23:04 PM.090		231,50	231,48
7/12/08 8:23:04 PM.100		231,68	231,61
7/12/08 8:23:04 PM.110		231,60	231,48
7/12/08 8:23:04 PM.120		231,50	231,33
7/12/08 8:23:04 PM.130		231,66	231,46
7/12/08 8:23:04 PM.140		231,71	231,56
7/12/08 8:23:04 PM.150		231,66	231,53
7/12/08 8:23:04 PM.160		231,53	231,41

Effective semi-cycle voltage table

As shown in the table title, data relative to the captured event is indicated, namely its date, type, duration, value, average voltage of the event and the previous voltage.

1.2.11 Displaying logged events[3]

Another important client tool is the ability to create tables showing information about past events. Access this view using the "*Views*" menu option, then "*Events*" and finally "*Event browser*" or directly from the "*Events*" button on the toolbar. A table of events from a SCADA screen can be created wherein the event display control can be added


Historic events - Week 39, 22 septiembre 2008 - 28 septiembre 2008 - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
Week 39, 22 septiembre 2008 - 28 septiembre 2008
Back Next Go to Grouped by Group Event Add up
Server Ok (192.168.5.52:8080)

Date and time	Name	Annotation	Recognized in	Desactivated in
lunes 22 00:00:00	Ocupación REALMENTE preocupante		8h 28m 9s	2m 0s
lunes 22 00:06:35	el primer evento	Se cumplió la condicion trunc(rand()*3000 + 1)==3000	8h 21m 34s	1s
lunes 22 00:44:01	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	1s
lunes 22 00:48:00	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	1s
lunes 22 00:53:02	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	3s
lunes 22 01:00:00	Ocupación REALMENTE preocupante		7h 28m 9s	2m 0s
lunes 22 01:00:18	el primer evento	Se cumplió la condicion trunc(rand()*3000 + 1)==3000	7h 27m 51s	1s
lunes 22 01:32:03	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	1s
lunes 22 01:44:00	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	5s
lunes 22 01:45:00	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	1s
lunes 22 01:52:00	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	1s
lunes 22 01:57:00	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	5s
lunes 22 02:00:00	Ocupación REALMENTE preocupante		6h 28m 9s	2m 0s
lunes 22 02:15:01	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	4s
lunes 22 02:56:00	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	5s
lunes 22 03:00:00	Ocupación REALMENTE preocupante		5h 28m 9s	2m 0s
lunes 22 03:00:33	el primer evento	Se cumplió la condicion trunc(rand()*3000 + 1)==3000	5h 27m 36s	1s
lunes 22 03:07:57	el primer evento	Se cumplió la condicion trunc(rand()*3000 + 1)==3000	5h 20m 12s	1s
lunes 22 03:08:04	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	2s
lunes 22 03:11:00	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	5s
lunes 22 03:24:00	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	2s
lunes 22 03:27:00	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	5s
lunes 22 03:33:04	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	2s
lunes 22 04:00:00	Ocupación REALMENTE preocupante		4h 28m 9s	2m 0s
lunes 22 04:03:02	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	1s
lunes 22 04:28:00	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	5s
lunes 22 04:35:02	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	3s
lunes 22 04:37:03	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	2s
lunes 22 04:43:00	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	5s
lunes 22 04:48:00	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	5s
lunes 22 04:50:04	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	1s
lunes 22 04:51:01	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	2s
lunes 22 04:55:02	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	2s
lunes 22 04:56:03	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	1s
lunes 22 04:59:02	Error del CVM Harmónicos	[CVM K.Armonicos.STATUS]!=1 && second() < 5	< not applied >	3s
lunes 22 04:59:27	el primer evento	Se cumplió la condicion trunc(rand()*3000 + 1)==3000	3h 28m 42s	1s
lunes 22 05:00:00	Ocupación REALMENTE preocupante		3h 28m 9s	2m 0s

Logged events table

This table has two different viewing modes, the normal mode and the total mode. The normal mode (above) table consists of five columns.

- ***Date and time:*** Indicates the date and time at which the incident occurred.
- ***Name:*** Name of event that occurred.
- ***Annotation:*** Description of the event when it is activated, which can include data related to the event or to the execution environment when the event is activated.
- ***Acknowledgement annotation***: Description of the event when it is acknowledged.
- ***Deactivation annotation***: Description of the event when it is deactivated.
- ***Recognized in:*** Time taken for the event to be acknowledged, whether or not it is finally acknowledged. Floating the cursor over a cell will bring up a tooltip with the date on which the event was recognized.
- ***Deactivated on:*** Time the event took to end, if it actually ended. Floating the cursor over a cell will bring up a tooltip with the date on which the event ended, if the event existed.

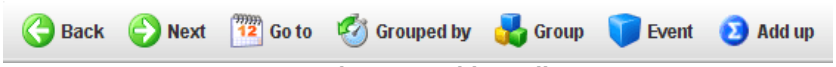
As a standard table, the active events table shows a time interval. These intervals may be navigated or modified using the toolbar and the first four buttons on the left, as was discussed in the section on graphs.

[3] Only in SCADA and Deluxe versions

As with the tables, the user can print the current graph page at any time using the “*Print*” option in the “*Options*” menu of the main menu or the "*Print*" button of the upper toolbar.

It is also possible to export this table by clicking "*Export*" in the "*Options*" menu of the main menu. It will be exported in text format, where each line of text is a row of the table and where each column is separated by the symbol ";".The table may also be sorted by the various columns as desired, for example, events may be sorted by duration, or even by type, and by the duration of each type as explained above in the general table properties.

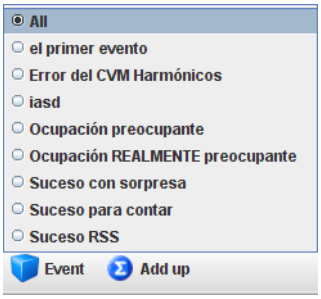
Note, however, that this type of table does not have a properties menu available that can be used to configure it. However, the toolbar provides some extra options that permit a certain degree of configuration for this type of table.



Logged events table toolbar

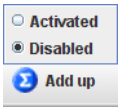
There are a couple of options that permit desired events to be filtered according to the group they belong to or according to a specific event.

Filtering events by group



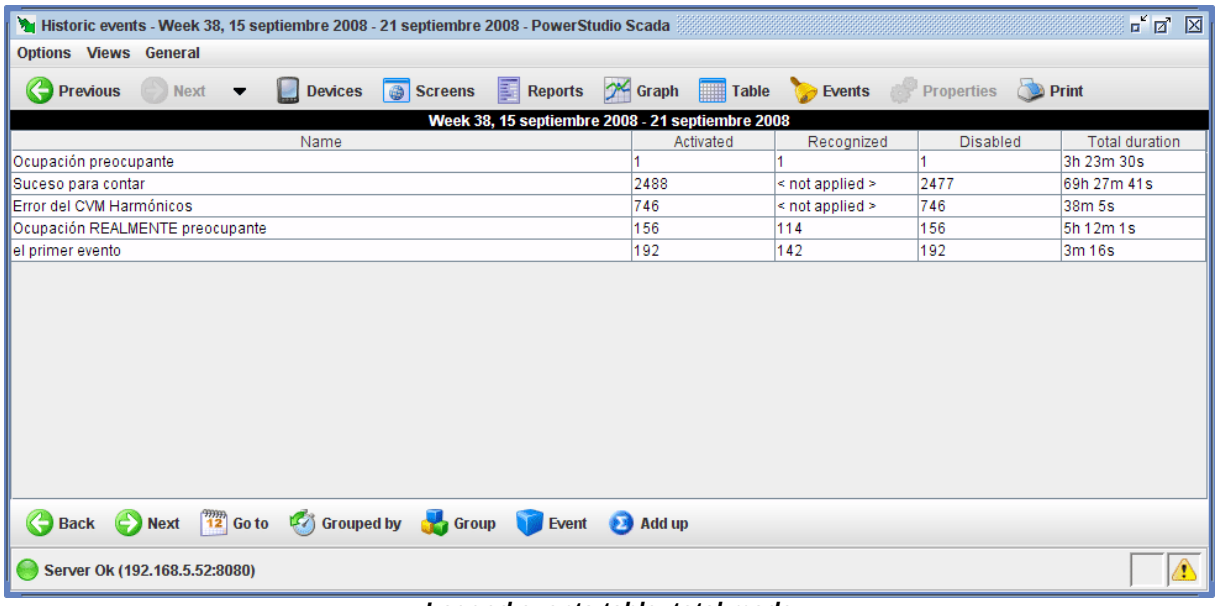
Filtering events by individual event

The latter option permits changes to the display mode. Thus, the total mode may be enabled or disabled.



Change the display mode by enabling or disabling the total view

Activating the total view produces the following list:


Historic events - Week 38, 15 septiembre 2008 - 21 septiembre 2008 - PowerStudio Scada
Options Views General
Previous Next Devices Screens Reports Graph Table Events Properties Print
Week 38, 15 septiembre 2008 - 21 septiembre 2008
Name Activated Recognized Disabled Total duration
Ocupación preocupante 1 1 1 3h 23m 30s
Suceso para contar 2488 < not applied > 2477 69h 27m 41s
Error del CVM Harmónicos 746 < not applied > 746 38m 5s
Ocupación REALMENTE preocupante 156 114 156 5h 12m 1s
el primer evento 192 142 192 3m 16s
Back Next Go to Grouped by Group Event Add up
Server Ok (192.168.5.52:8080)

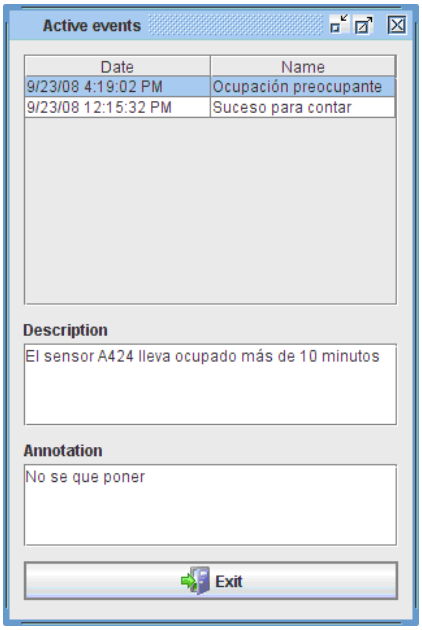
Logged events table, total mode

In this mode the table consists of five columns, one less than in the previous, and as many rows as events defined in the environment. The first column indicates the event name, the second the number of times it has been enabled in the period to which the data refers (indicated in the title), the third column indicates how many times this event has been acknowledged (or <not applicable> if the incident is not reported), the fourth column indicates how many times it has been disabled, and the fifth the total time that the event has been active.

1.2.12 Active and reported events[4]

The powerStudio client enables current events to be viewed in real time, both the simple events that are active as well as those that must also be acknowledged by the user.

Events not requiring user acknowledgement are displayed in a pop-up window, which may be accessed via the "*Views*" menu option, then "*Events*" and finally "*Active events*" or directly from the status bar by clicking on the icon indicating there are active events in the system. This window can be viewed from a SCADA screen where an active event control has been added.



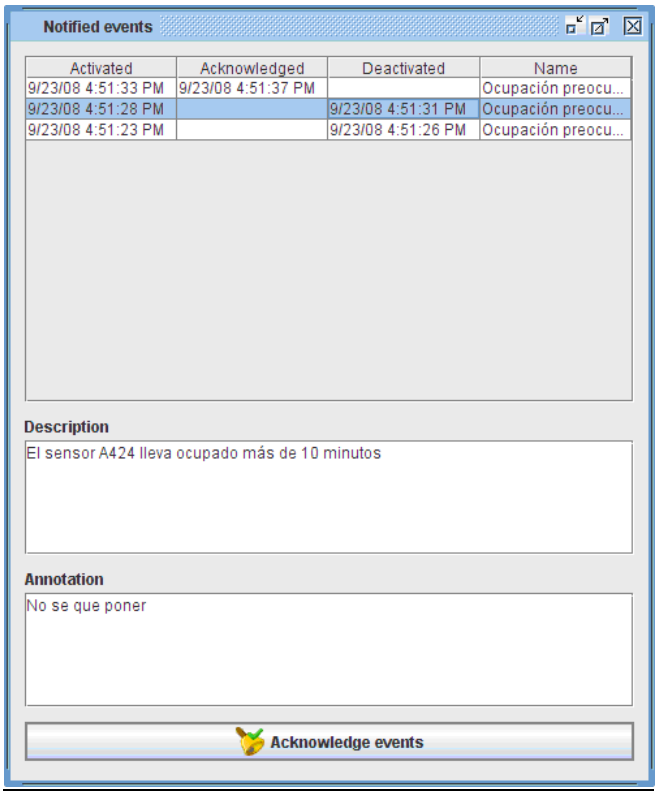
Active event window

[4] Only in SCADA and Deluxe versions

The date on which the event was enabled and its name can be seen. In addition, below, the description selected and its programd annotation can be seen. This window is purely informative and no action can be carried out here. In addition, it shows both those events that require user acknowledgement as well as those which do not.

On the other hand, events requiring user acknowledgement are displayed in a pop-up window that always remains visible and are shown automatically without user intervention when there are events reported active or to be acknowledged (or both).

The information displayed by this window is very similar to that shown in the active events window, but in addition to showing the activation date and the event name; the date it was acknowledged by the user and disabled is shown.



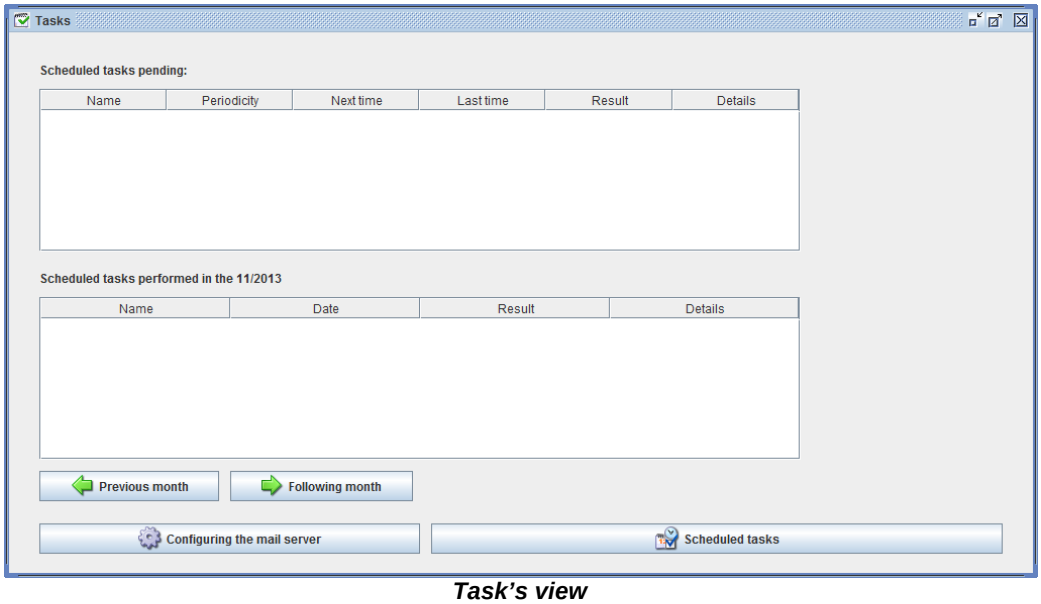
Reported events window

Note that an event with an acknowledgement date and a deactivation date will disappear from the list of events reported, i.e., there will be events on this list without an acknowledgement register, without a disable date, without both dates, but not with both dates.

This window allows event acknowledgement. Select from the events to be acknowledged from the events list and click the "*Recognize events"* button at the bottom. The event acknowledgement date is shown. When an event is disabled it will disappear from the list. If a previously acknowledge event is acknowledged again the operation will not produce any effect.

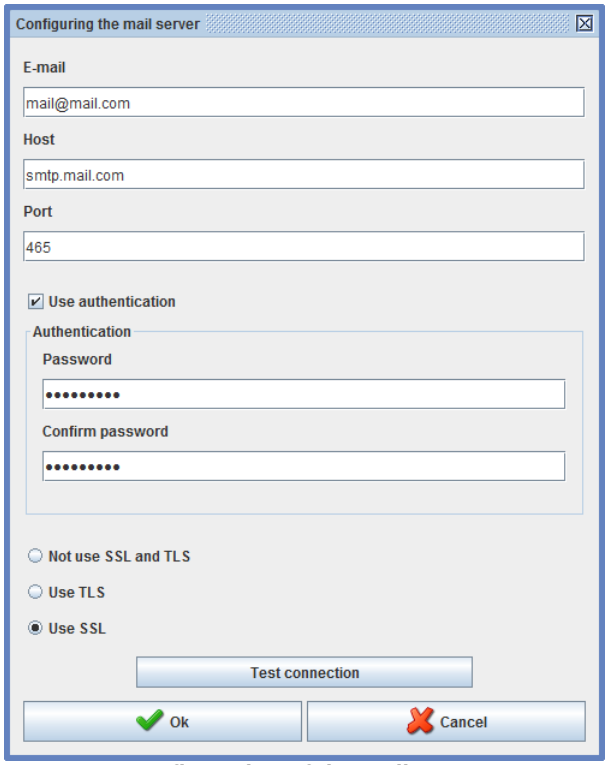
1.2.13 Tasks[5]

The *"Tasks"* tool allows the user to send reports via email or to save them to PDF with programmed tasks. This function allows you to select the frequency with which a report will be sent, the selected period and the validity interval of the task, among other functions.



Task's view

The mail server must be configured with the *"Configuration of the mail server"* option to send reports via email. The following dialog box will be opened when this option is selected:



Configuration of the mail server

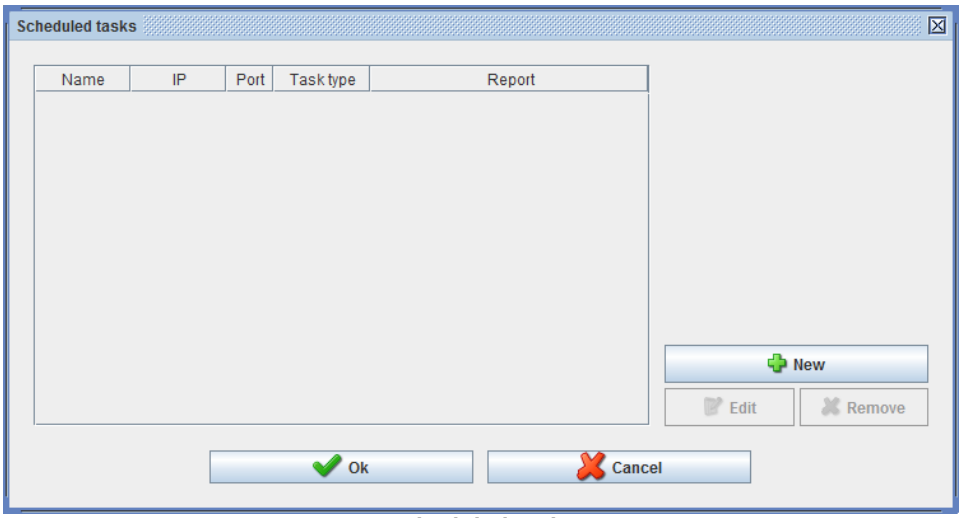
The following fields are displayed:

- E-mail: Enter the mail server address from which emails will be sent.

[5] Available only for Java client

- Host: Enter the host of the email address. For example, the host for myaddress@gmail.com will be smtp.gmail.com
- Port: Enter the port of the host that was entered above.
- Authentication: This option should be activated if the email being used as the source of emails has a password.
- Security: Select the security protocol used by the mail server from the options 'Does not use SSL or TLS', 'Uses TLS' and 'Uses SSL'.
- Test connection: In this section, you can

Select *"Programmed tasks"* to create and configure the tasks. This option will display the tasks that have been created and their main features; all data will be shown on the right part of the dialog box.



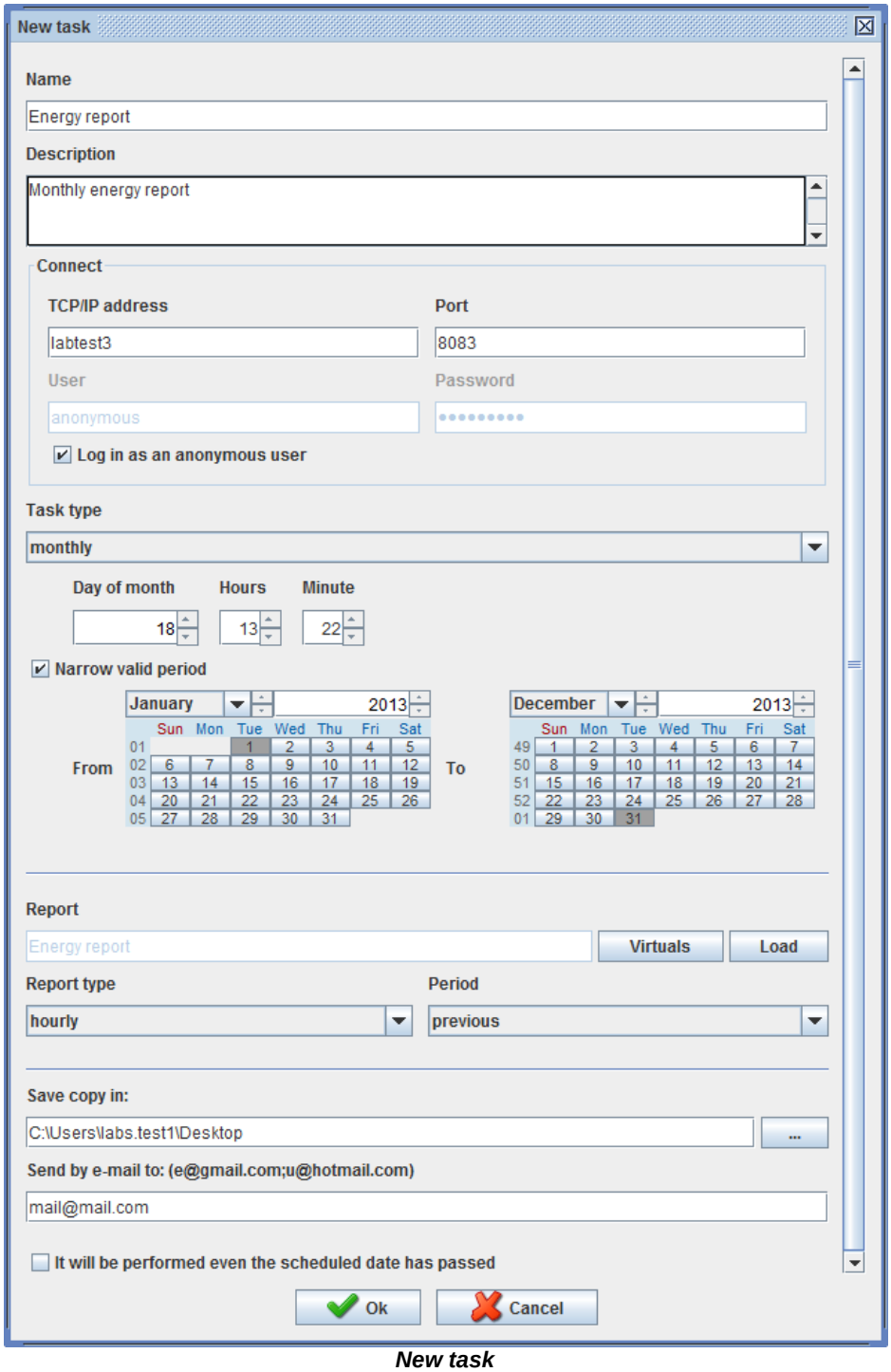
Scheduled tasks

The columns of the dialog box will show the following information:

- Name: Shows the name entered for the task.
- IP: Shows the address of the engine from which the report will be extracted and the data that will be sent.
- Port: Shows the port of the engine from which the report will be extracted and the data that will be sent.
- Type of task: Shows the frequency that has been selected for the task.
- Report: Shows the name of the report that will be sent when the task is activated.

The 'Edit' and 'Delete' buttons will only be active when a task has been selected. Likewise, when you select a task, detailed information will also be displayed on the right hand side of the dialog box, so you can view all of the task's features without having to open the task again.

To create a task, click on the *'New'* button and the following dialog box will be displayed:



New task

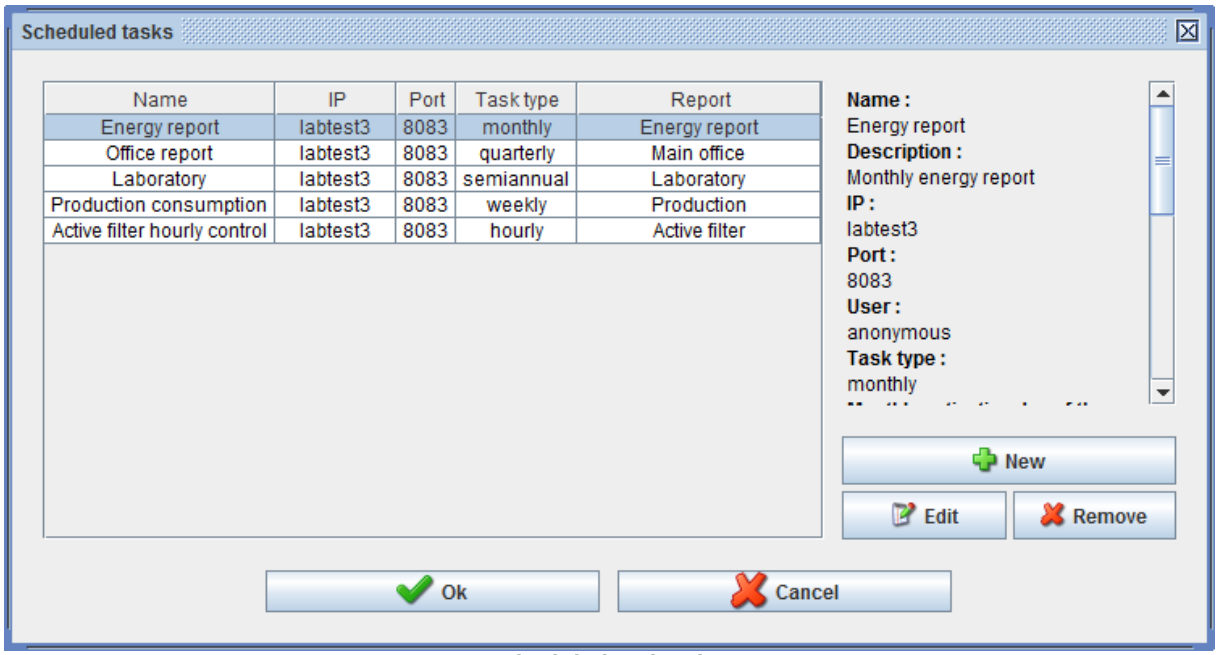
The task creation screen shows the following fields:

- Name: Name of the task.
- Description: A brief description of the contents of the task or report in which the task is included.
- Connect: TCP/IP address and port of the report that will be attached to the task. The user and password must be entered if the authentication function has been activated in the engine
- Type of task: Select the task frequency as follows:
    - Punctual: The task will only be executed once.

- Hourly: The task will be executed every hour at the minute selected by the user.
- Daily: The task will be executed on a daily basis, at the hour and minute selected by the user.
- Daily Inter-week: The task will be executed on a daily basis from Monday to Friday.
- Daily - Weekends: The task will be executed on a daily basis on Saturday and Sunday.
- Weekly: The task will be executed on a weekly basis, on the day and at the hour and minute selected by the user.
- Monthly: The task will be executed on a monthly basis, on the day and at the hour and minute selected by the user.
- Two-monthly: The task will be executed on a two-monthly basis, on the day and at the hour and minute selected by the user.
- Quarterly: The task will be executed on a quarterly basis, on the day and at the hour and minute selected by the user.
- Six-monthly: The task will be executed on a six-monthly basis, on the day and at the hour and minute selected by the user.
- Annually: The task will be executed on an annual basis, on the day and at the hour and minute selected by the user.

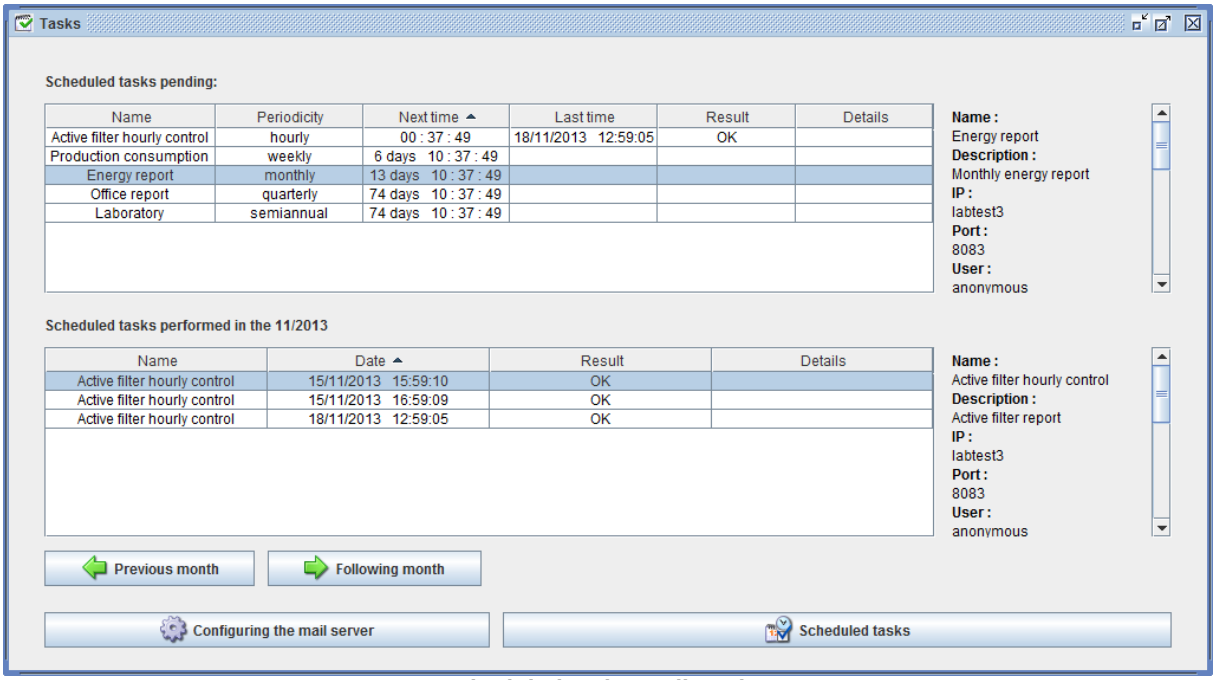
- Validity period: The period during which the task will be activated can be established.
- Report: The selected report that will be sent when the task is activated.
- Type of report: The data interval with which the report will be created. The same intervals as those established for the frequency explained above will be used.
- Period: Allows you to select the current period or a previous period.
- Save copy in: Allows you to enter the route where the report will be saved in PDF format in your computer.
- Send email to: Allows you to enter the email address to which the report will be sent in PDF format.
- The report will be sent even if the programmed time has expired: Allows you to send a task when the application is opened, even if the *"Tasks"* have not been activated when the task has to be sent.

Click on *'Accept'* and the task will be included in the list of *"Programmed tasks"*. You can create new tasks, edit tasks that have already been created or delete tasks on this screen.



Scheduled tasks view

Finally, click on *'Accept'* and the task will be added to the list of *"Pending programmed tasks":*



Scheduled task pending view

The top part of the dialog box shows the tasks that are pending to be sent with the following information:

- Name: Name of the task.
- Frequency: The frequency with which the task will be sent.
- Remaining time: The time remaining before the next task is sent.
- Last date: Date when the task was last sent.
- Result: Status of the last delivery.
- Details: In case of error, this field will show the cause.

The bottom of the dialog box shows the tasks completed on a monthly basis. The following sections will be displayed:

- Name: Name of the task.
- Date: Date when the task was sent.
- Result: Status of the last delivery.
- Details: In case of error, this field will show the cause.

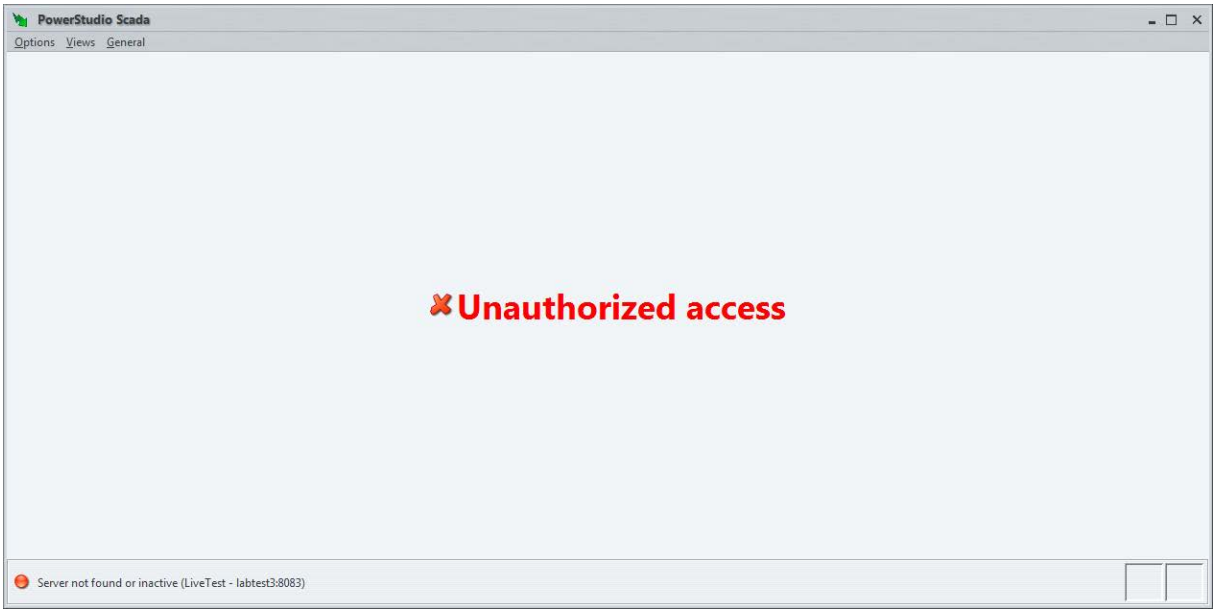
Click on the *'Previous month'* and *'Next month'* buttons to view the log of other months.

1.2.14 Authentication

If user authentication is enabled from the editor, the client may request a user name and password to access the various resources available. This will be done through a screen like this:

User authentication window

The user must correctly identify himself to access the resource. If the user and password are unknown try a connection as an anonymous user, which provides access to certain resources provided it has been properly configured from the editor. If the user is not identified correctly (three attempts are allowed) the client will not be allowed access to the resource.



Access to the resource denied

It is possible that once authenticated, the client will require identification again when trying to enter an area without having viewing privileges.

In any case, the current session may be closed in order to force the client to request user identification again. This can be done via the "*Logout*" option from the "*General*" menu in the main menu.

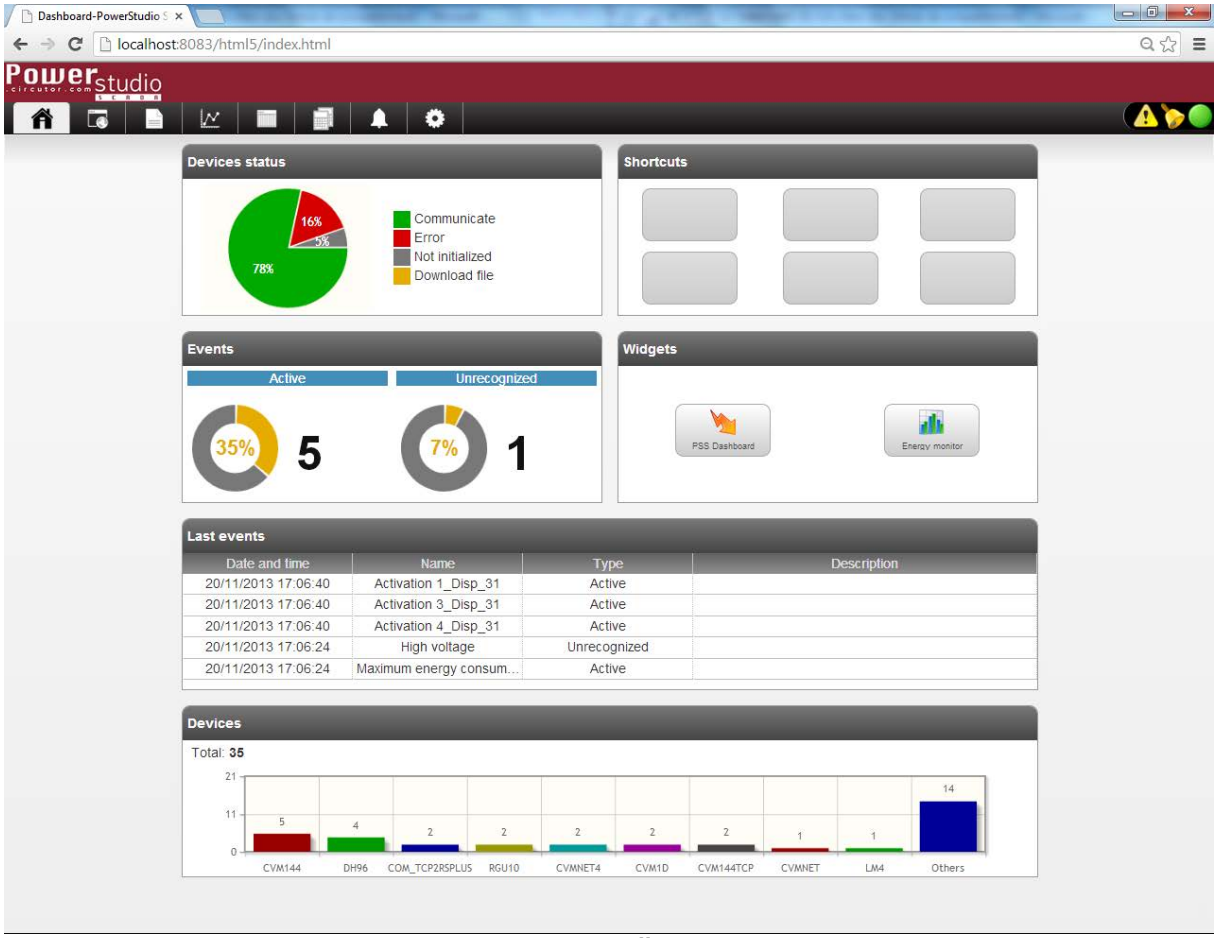
"General" Menu

1.3.- HTML5 Client

The HTML5 and Java clients are responsible for displaying all information generated by the communications engine and resource editor. Take into account that the client is a program that is independent of the platform.

The HTML5 client is accessed directly from the web site, at the address where the engine is installed, as in the case of the embedded Applet. One of the following browsers must be used: Google Chrome (version 30.0 or higher), Internet Explorer (version 10.0 or higher), Mozilla Firefox (version 24.0 or higher), Opera (version 12 or higher) and Safari (version 5 or higher). A message will be displayed if your browser is not supported by the system.

The client has been designed with a philosophy similar to its predecessor. In this case, a renewed and innovative approach has been followed, with a focus on the display of PowerStudio in smartphones and tablets.



HTML5 Client

As shown in the previous image, the client mainly consists of three different areas: the toolbar on the top, the status bar on the top right and the active view in the centre. The window's title shows the name of the view being displayed.

The toolbar shows all options available in the client, browsing through the views, a shortcut to each view, the general options, etc. The current view displays the current active resource, i.e., a Scada screen, a report, a device, etc. The status bar shows general information about the application, indicating the status of server communications, active events, etc.

1.3.1 Status bar

The client status bar shows general and relevant information about the application, such as, for example, the server communication status

Status bar communicating correctly with the server

If the client has established a connection with the engine, the right section of the toolbar will show a green indicator to show that the server is active and communicating correctly through the given address and port. If the client cannot establish a server connection, this will also be indicated.

Status bar not communicating with the server

the client's inability to establish a connection may be due to the following:

- *The IP address or port is incorrect*: The IP address or port to which the client is being directed to search for the server is incorrect. Check the correct IP address and port with which the engine is being configured.
- *The engine is not being executed*: Make sure the server program (the engine) is running on the machine the client application is trying to connect to.

Engine is not enabled as a web server: Make sure that the engine has managed to boot the web server at the specified port.

Likewise, the icon to the left of the panel indicates whether there are active events in the application and the central icon shows whether there are events pending acknowledgement.

Active events

In both cases, you can double-click on the icon to inspect the associated view with more details. in the first case, the *'Active events'* view will be displayed and in the second case the *'Reported events'* view will be displayed.

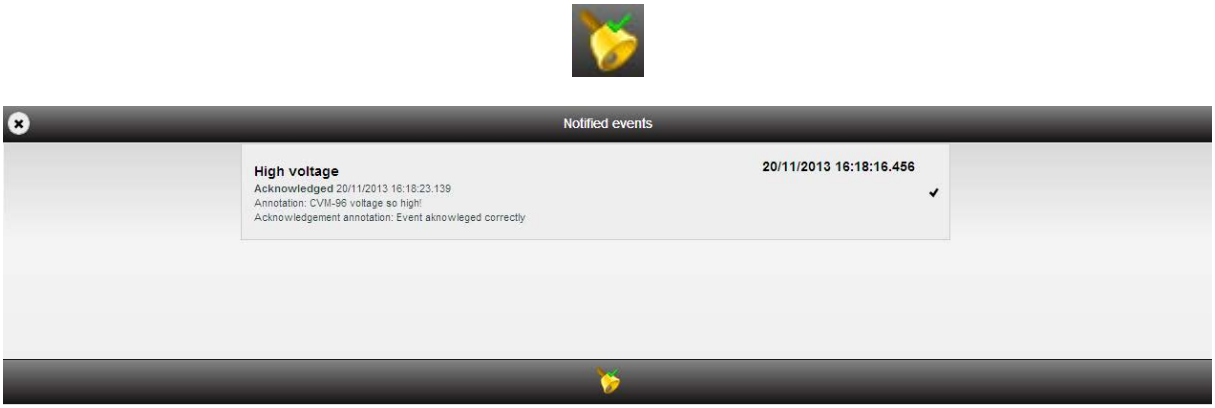
The first screen shows the date when the event was activated and its name. This window is purely informative and no action can be carried out here. In addition, it shows the events that require user acknowledgement as well as those which do not

On the other hand, the events that require user acknowledgement are shown in the *'Reported events'* option, which is automatically activated with no user intervention when there are active reported events or events pending acknowledgement (or both).

The information displayed by this window is very similar to that shown in the active events window, but in addition to showing the activation date and the event name, the date it was acknowledged by the user and disabled is shown.

Note that an event with an acknowledgement date and a deactivation date will disappear from the list of events reported, i.e., there will be events on this list without an acknowledgement register, without a disable date, without both dates, but not with both dates.

This window allows event acknowledgement. Select from the events to be acknowledged from the events list and click the "*Acknowledge events"* button at the bottom. The event acknowledgement date is shown on the list. If an event is disabled it will disappear from the list. If a previously acknowledged event is acknowledged again, the operation will not produce any effect.



Notified events

Note: The status bar can be hidden by selecting the "*Enable status bar*" option in the editor's "*Preferences*".

1.3.2 Toolbar

The toolbar allows the user more direct access to the most important options at all times.

Toolbar

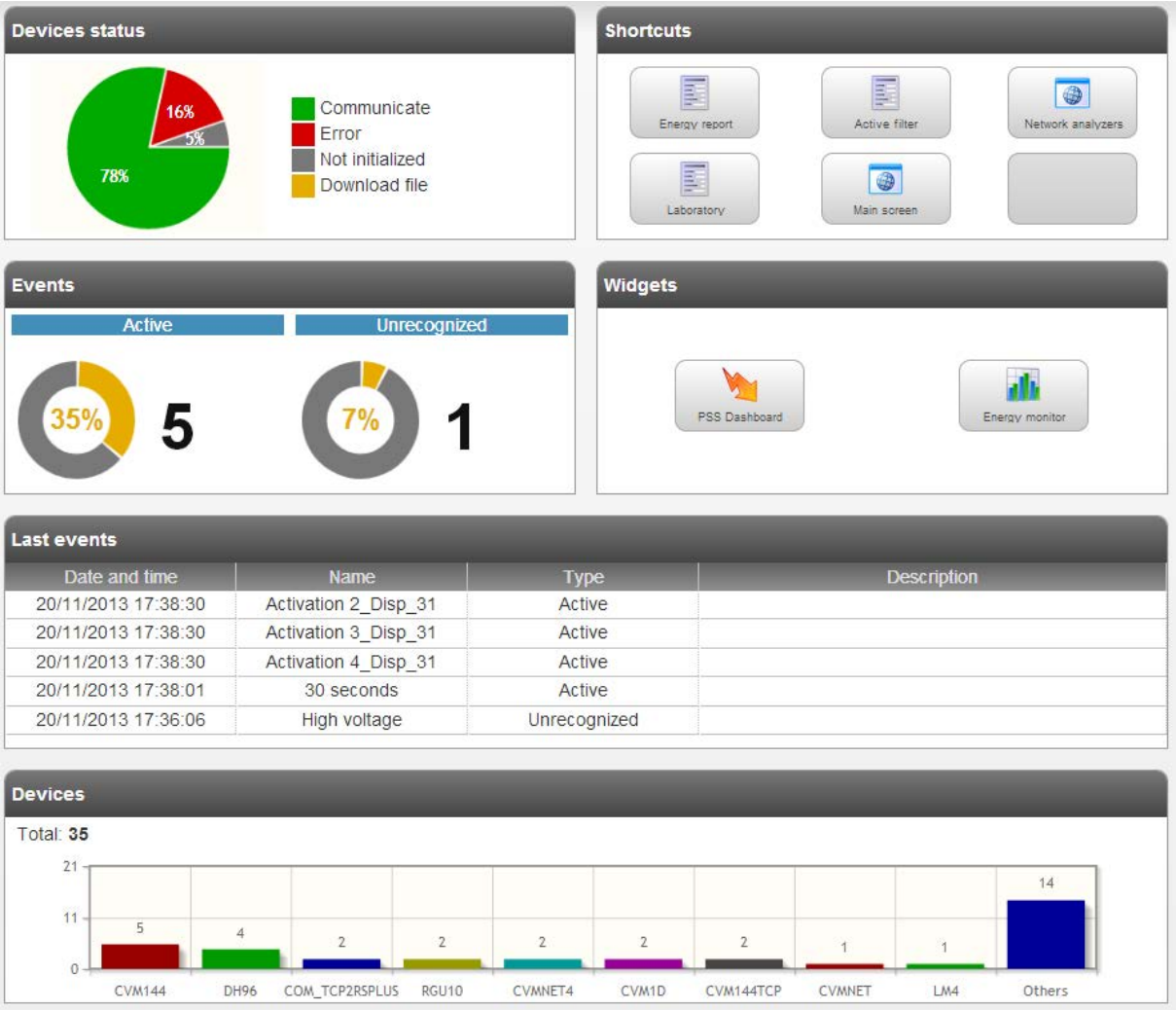
Therefore, the following options are available on this bar:

- **Home**: Opens the dashboard
- **Screens:** Displays one of the user-defined SCADA screens.
- **Reports:** Displays one of the user-defined reports.
- **Graphic**: Creates a graphic.
- **Table:** Creates a table.
- **Devices:** Opens the monitoring view of a specific device directly through the device tree.
- **Events:** Displays the event history.
- **Options**: Allows you to change the language, configuration options and client version.

Note: The toolbar can be hidden by selecting "*Enable menu bar"* and "Enable toolbar" options in the editor's "*Preferences*".

1.3.3 Dashboard

The dashboard is the main screen of the HTML5 client. This will be the default display when the client is accessed and it will show summarised information of the application.



Dashboard

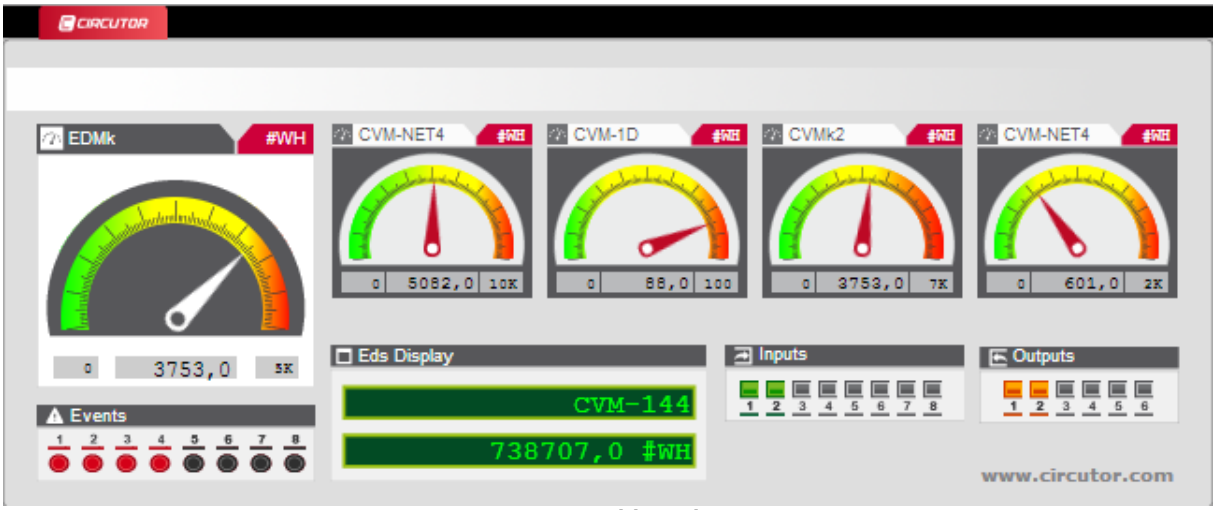
This screen shows the following sections:

- **Device status:** Shows a circular graphic with the status of the units. Possible states are: communicating, error, not initialised and downloading file.
- **Shortcuts:** Shows the last screens and reports that have been opened. Click on a shortcut to access these screens and reports without having to search for them again.
- **Events:** Shows two circular graphics: an active event graphic and a graphic for events that have not been acknowledged. The percentage is calculated with the total number of events.
- **Widgets:** Shortcuts to the PowerStudio widget and energy monitor.
- **Last events:** Shows a list of the last events with their date, name, type and description.
- **Devices:** Shows a bar graphic with the units, arranged by type of device.

1.3.3.1 Widget PSS Dashboard[6]

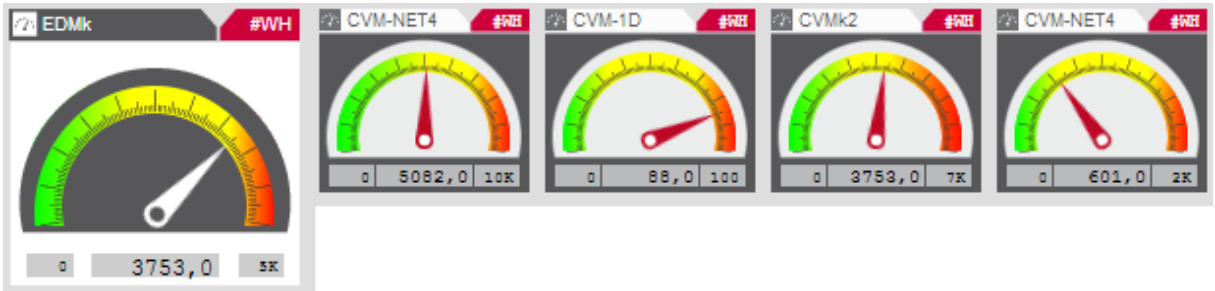
The *"PSS Dashboard"* Powerstudio widget is a variable and event monitoring tool, with various parameters that can be configured by the user. The main features are as follows:

- Monitoring of up to 6 variables (5 with analogue meters and 1 with a digital meter).
- Custom configuration of the maximum/minimum values of each variable associated to analogue meters.
- Configuration of the colour zone of variables associated to analogue meters with 3 values: minimum, maximum and intermediate point.
- Custom configuration of up to 8 events inherited from the engine's active application.
- Configuration of the digital inputs and outputs of a unit



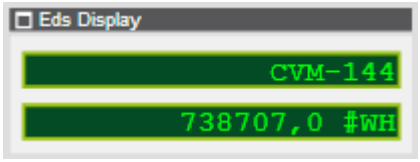
PSS Dashboard

The top centre of the main view shows the analogue meters. The first meter is slightly larger than the rest, while the remaining four will have the same size. The top left of the meter will show the name of the variable or custom name entered, while the right will show the units of the selected variable. It will also show the minimum and maximum values configured with their associated colour representation.



Analogue meters

The top centre shows a digital meter, which can be shown as a rotary digital display with up to 5 variables. The digital display will change to the next variable after a period of time. The display shows 2 lines; the top line shows the name of the variable and the bottom line shows its value.



Display-shaped digital meter

[6] Available gadget version for Windows 7

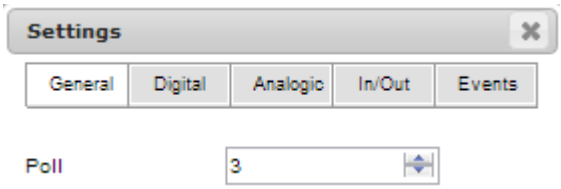
The top left hand side of the screen shows the configured events. Up to 8 events inherited from the engine's active application can be added. The corresponding LED will be lit if they are activated to notify the user about their change in status.

Events

The inputs and outputs can be seen on the lower right hand side at the other end of the widget. When these inputs or outputs are activated in the configured unit, they will activate the corresponding LED to notify the user that they are being used.

Digital inputs and outputs

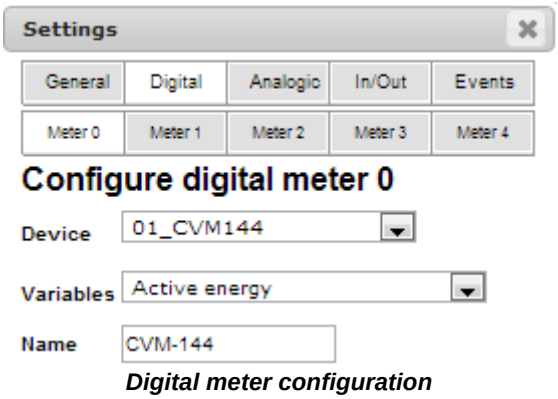
Finally, the top right hand side shows the configuration panel, where each one of the following sections can be configured: general, digital, analogue, inputs/outputs and events.



General configuration

Firstly, the following fields will be shown on the general configuration screen:

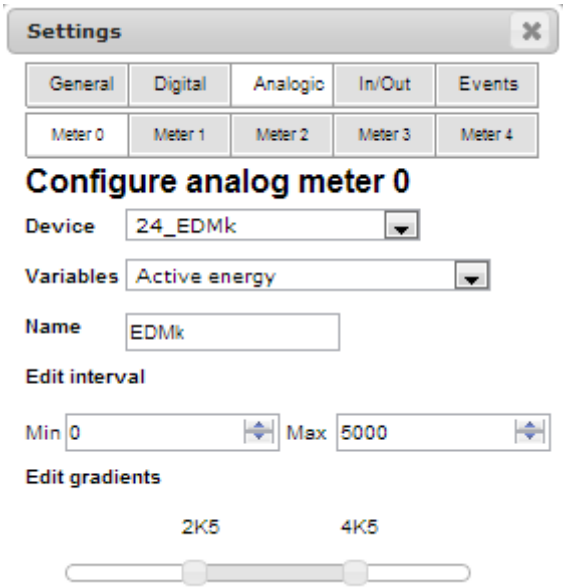
- IP: Allows you to change the address to which the unit will be connected.
- Port: Allows you to add the port to the IP Address.
- Authentication: Allows you to select an anonymous user or a specific user and password to access the widget.
- Refresh time: Allows you to change the time at which the monitoring values will be updated.
- Language: Allows you to change the language of the widget.



Digital meter configuration

Secondly, the "Digital" tab will show 5 sub-sections where each variable added to the rotary display can be configured, as shown in the previous image. This section will display the following configurable fields:

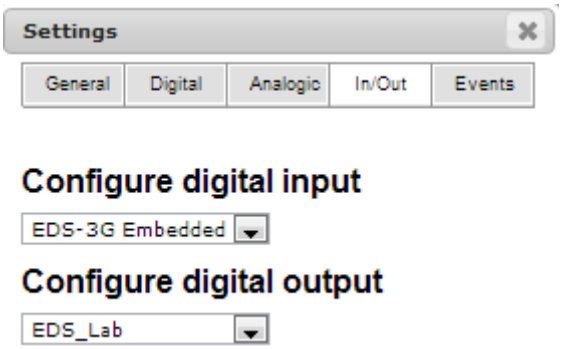
- Device: Allows you to select the unit
- Variable: Allows you to select the variable that will be displayed
- Use a custom name for the meter: Select and enter information into this field to rename the meter with a custom name. Otherwise, it will show the name of the variable.



Configuration of analogue meters

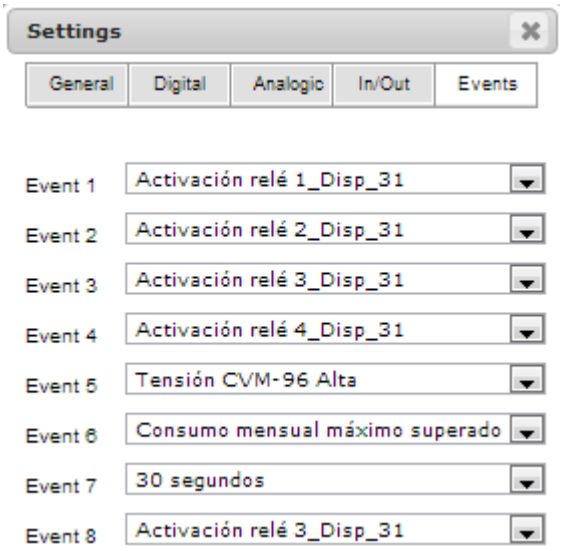
Thirdly, the "Analogue" tab shows the 5 analogue meters that can be configured with the following fields, as shown in the previous capture:

- Device: Allows you to select the unit
- Variable: Allows you to select the variable that will be displayed
- Use a custom name for the meter: Select and enter information into this field to rename the meter with a custom name. Otherwise, it will show the name of the variable.
- Configuration of the interval: Allows you to select an automatic or manual interval. If a manual interval is selected, the values can be entered with the edit fields or the sliding bar.



Digital input and output configuration

Fourthly, the destination of the digital inputs and outputs associated to a unit can be configured, i.e., you must select the unit to apply the notifications related to its inputs and outputs sent to the widget.

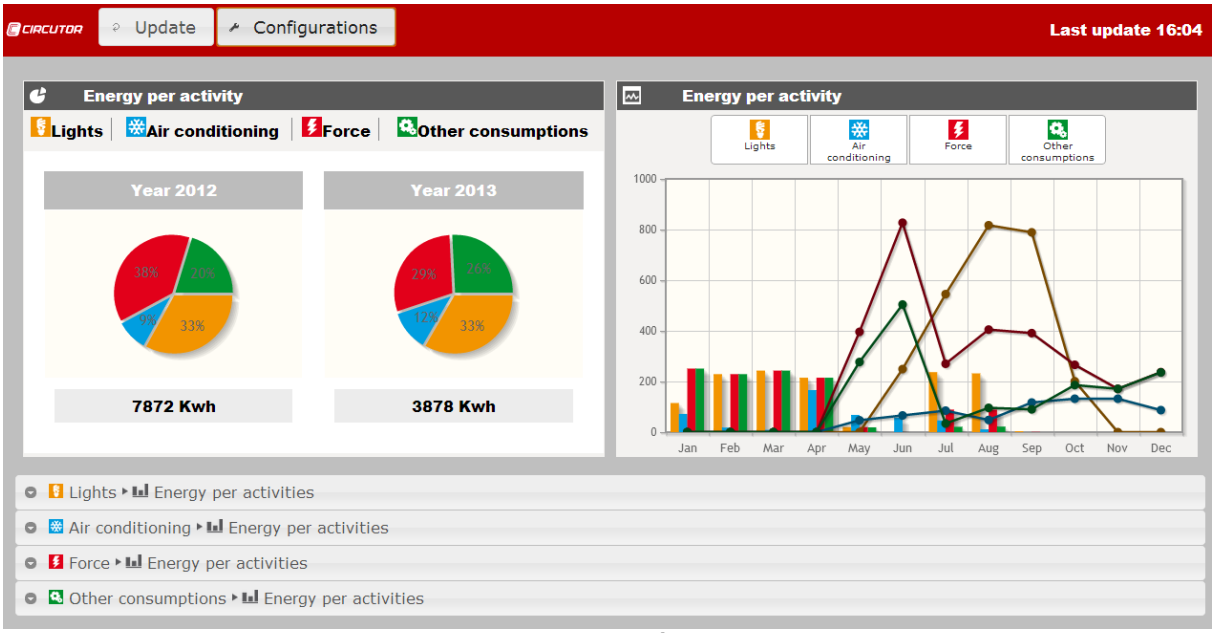


Configuration of events

Finally, to configure an event, simply select the events that will be shown in each field. Up to 8 events can be configured.

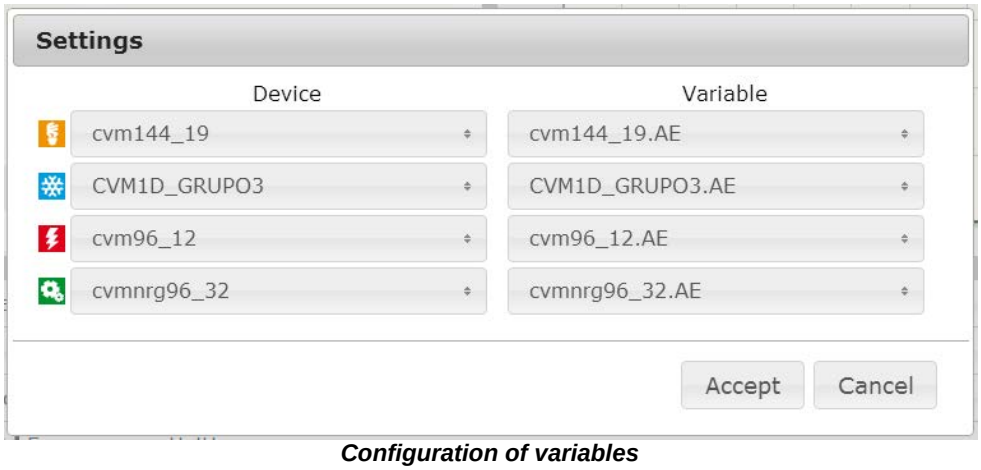
1.3.3.2 Widget energy monitor

The energy monitor widget is a tool that provides the user with a more detailed, accurate and graphical view of the variable data.



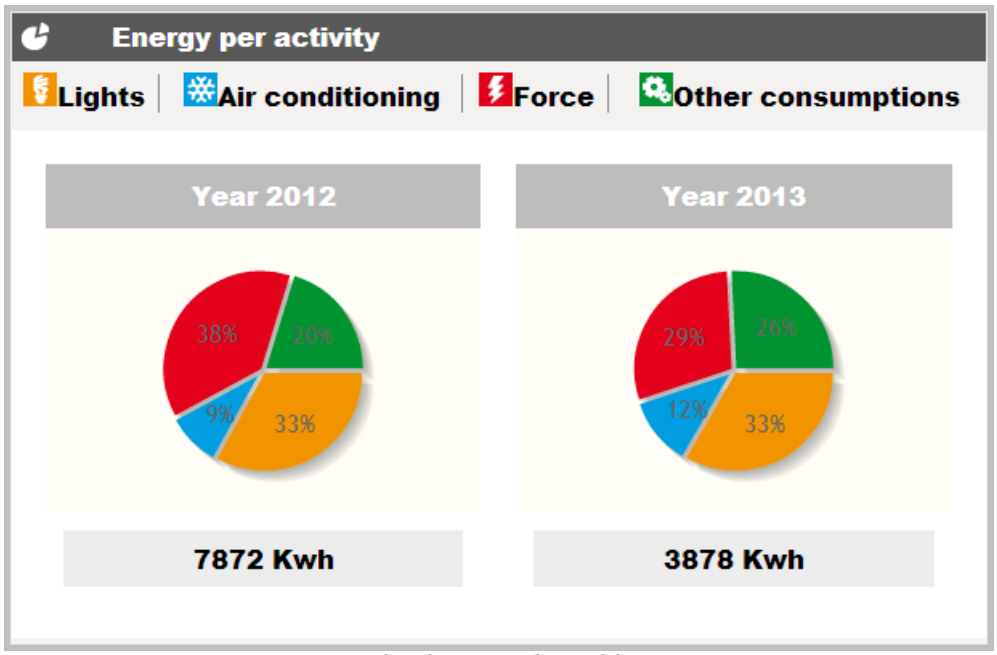
Energy monitor

Select "Configuration" when using it for the first time. The monitor will show the list of devices with our configuration and their respective earth leakage variables; i.e., energy in most cases. Up to 4 variables can be selected for display; the first variable will be assigned to the *'Lighting'* field, the second to the *'Air conditioning'* field, the third to the *'Force'* field and the last to the *'Other consumption'* field. These names are provided for information purposes only and do not force the user to assign a specific type of energy to a field, i.e., any earth leakage variable can be assigned to each field.



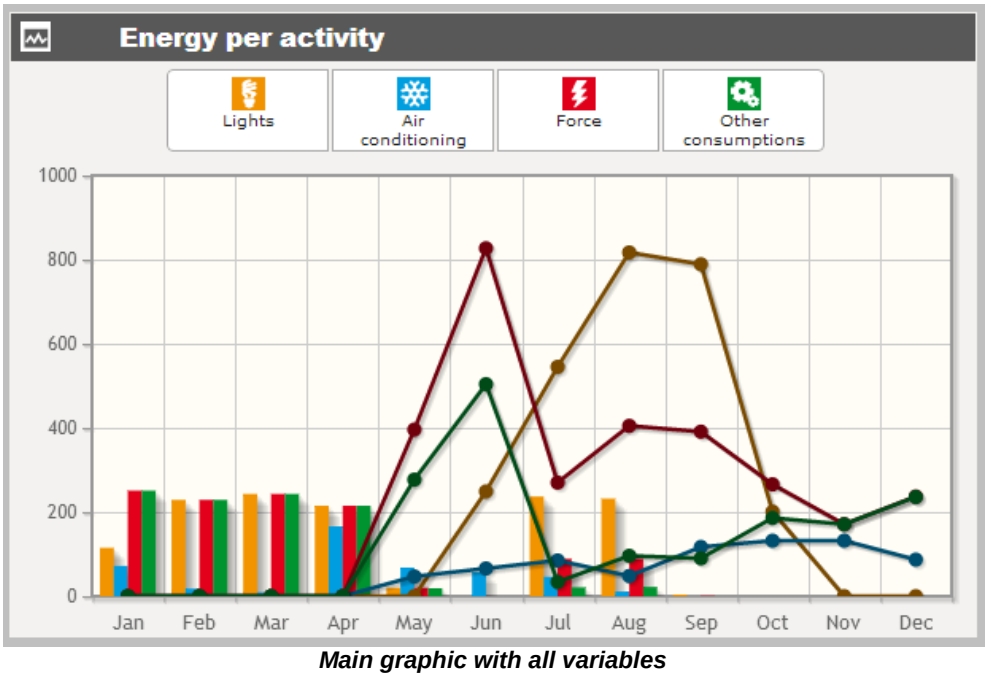
Configuration of variables

When the configuration is accepted, the data saved in the log of each variable will be loaded and shown in the widget. This data can be viewed on the circular annual summary graphics.



Circular annual graphic

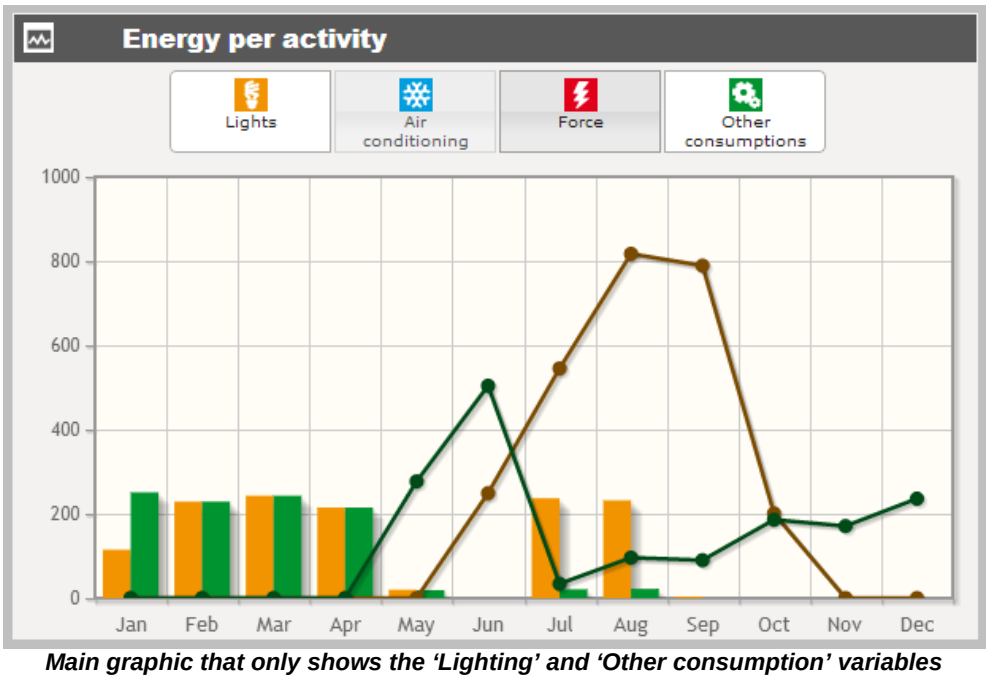
On the other hand, the data of all variables added to the main graphic of energy by activity can also be handled. On this graphic, the data of the previous year will be drawn in a line and the data of the current year will be drawn on a bar.



Main graphic with all variables

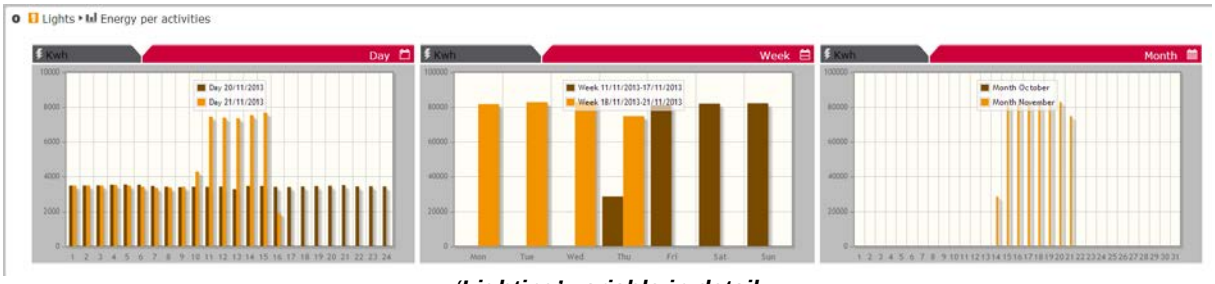
Move the mouse over the point that you wish to view to show more details about the values shown on the circular and main graphics.

In addition, you can select or deselect the variables to be displayed by clicking on the corresponding button. In this case, deselect the *'Air conditioning'* and *'Force'* variables:



Main graphic that only shows the 'Lighting' and 'Other consumption' variables

Finally, more detailed information about the comparison of data of the same variable can be shown by clicking on the drop-down menus on the bottom of the widget. The following view shows a daily comparison of the times between the last and current dates, a weekly comparison by date, between the last and current weeks and a monthly comparison between the last and current months.



'Lighting' variable in detail

The 'Update' button can be clicked on the top left of the widget to refresh the data of all variables, so that the latest data is downloaded. In addition, the widget will be automatically updated on a regular basis; the last update time will be shown on the top right of the application.

Note: A 1920x1080p resolution is recommended for an optimum view of this widget.

1.3.4 Displaying SCADA screens[7]

One of the most important features of the client is its ability to display SCADA screens defined and designed in the editor, both local and remote. You can display any SCADA screen defined directly from the "*Screens*" button on the toolbar.

SCADA screens basically consist of a background image (which may or may not exist and is therefore white) and a series of controls placed on it. The information provided by a SCADA screen is updated on an ongoing basis. It acts on the basis of two main types of controls, those displaying some kind of data and those which require or allow user intervention.

The display controls simply show information on the screen. There are various types of information which may or may not vary over time depending on the type of control. For example, a formula varies over time depending on the values of the variables that make it up, and conversely a static image is always fixed. Display controls are:

- Text control
- Image control
- Date control
- Formula control
- Filler control
- Conditioned control
- Flood fill control
- Dynamic image control
- Analogue bar control
- Embedded graphic control
- Primitive control

For scope and detailed operation of these controls see the SCADA screens editing manual section.

Click on the action controls to use them. When on a control action since the cursor will change to a hand with the index finger extended, rather than the typical arrow.

The typical action control lets you change your SCADA screen and provides a simple and intuitive way to navigate through the designed application. Action controls are:

- Screen control
- Report control
- Device control
- Graph / table Control
- Active events control
- Event view control
- Execution Control
- Forcing variables control

For scope and detailed operation of these controls see the SCADA screens editing manual section.

All SCADA features are shown on the screen and are fully dependent on the design used when defining the controls.

[7] Only in SCADA and Deluxe versions

1.3.5 Displaying reports[8]

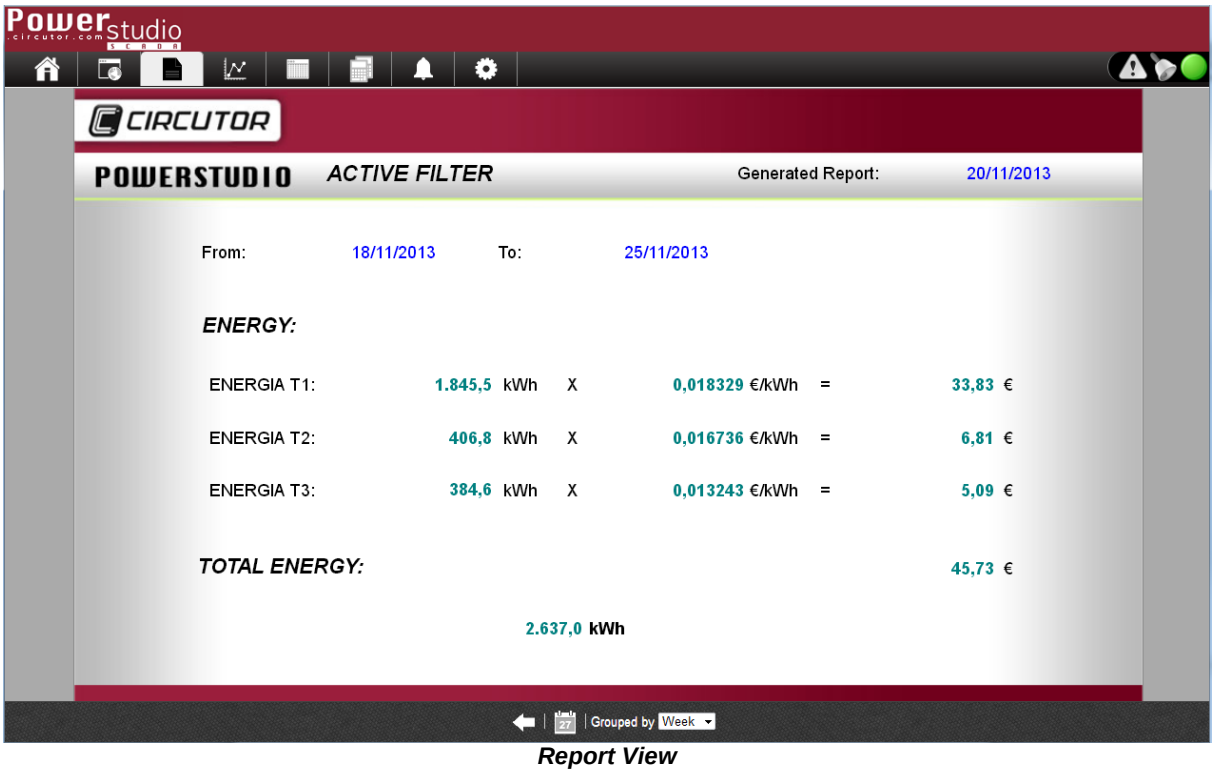
Another of the prominent client application features the ability to see reports defined and designed in the editor both locally and remotely. You can display any defined report directly from the "*Report*" button on the toolbar. You may also access a particular report from a SCADA screen where a control report has been added, which will point directly to the report defined.

The reports consist essentially of a series of pages and each page consists of a background image (which may not exist and hence be white) and a series of controls placed on it. The controls available in a report are as follows:

- Text control
- Image control
- Date control
- Formula control
- Conditioned control
- Graph control
- Analogue bar control
- Embedded graphic control
- Primitive control

For scope and detailed operation of these controls see the reports section in the edition manual.

The information provided by a report is always related to a period of time and will only be updated in response to changes in this period by the user via the lower toolbar.


Power studio
CIRCUTOR
POWERSTUDIO
ACTIVE FILTER
Generated Report: 20/11/2013
From: 18/11/2013 To: 25/11/2013
ENERGY:
ENERGIA T1: 1.845,5 kWh X 0,018329 €/kWh = 33,83 €
ENERGIA T2: 406,8 kWh X 0,016736 €/kWh = 6,81 €
ENERGIA T3: 384,6 kWh X 0,013243 €/kWh = 5,09 €
TOTAL ENERGY: 45,73 €
2.637,0 kWh
Grouped by Week

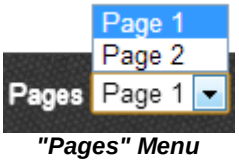
Report View

Unlike a SCADA screen, in a report there are no active controls that react to user actions, so that interaction with the report reduces the options available in the menus or toolbars, especially the lower toolbar, which is typical of this type of view.

[8] Only in SCADA and Deluxe versions

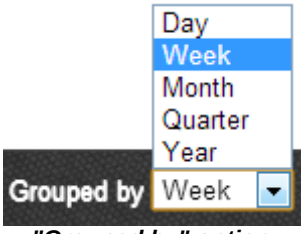
Reports toolbar

From the toolbar the desired page of the report can be displayed using the "*Pages*" buttons. This option does not appear if the report consists of a single page.



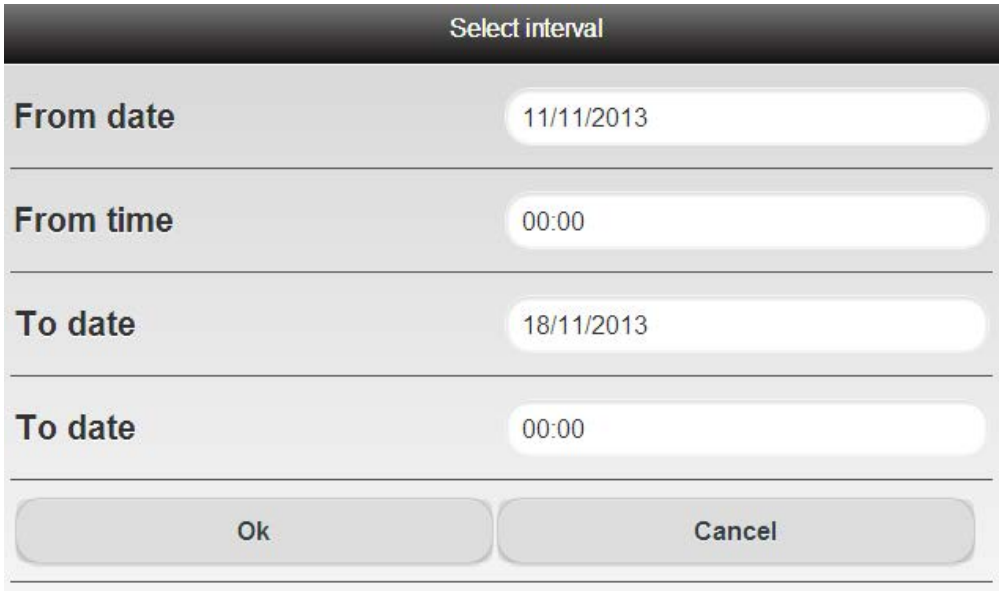
"Pages" Menu

The user can change the grouping period the report refers to at any time. This is done using the "*Grouped by*" option on the toolbar.



"Grouped by" option

As can be seen, the application provides quick access to daily, weekly, monthly, quarterly and annual reports. To display a report of a period not included in any of those pre-defined, select the "*Go*" option, the calendar button, on the toolbar.



Report interval selection window

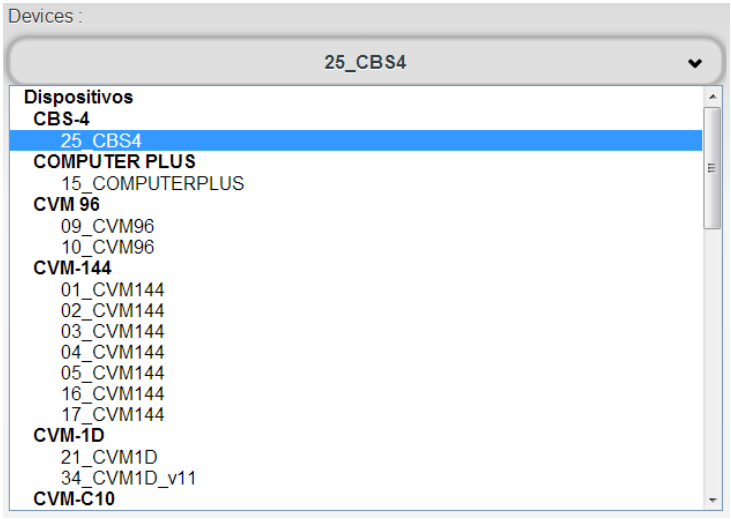
Use this window to exactly specify the report period. For example, to make a report of the first 5 days of a month, or the first 6 hours of a day, and so on.

Irrespective of the period over which the report is made, the user can scroll to the previous period or next (if any), using the "*Back*" and "*Next*" buttons in the toolbar below. Thus, if grouped by day, the "*Back*" button displays the previous day; if grouped by week, the "*Next*" button displays the following week.

1.3.6 Making graphs

One of the most powerful tools of the client is the possibility of making graphs of the device variables (trends). This view can be accessed directly from the "*Graph*" button on the toolbar. Graphs can be made from a predefined SCADA screen where the graph control has been added or, as mentioned in the previous chapter, from the buttons defined for this purpose in some types of device monitoring views (e.g. a QNA monitoring view).

Typically, to make a graph the variables of the device that will be part of it need to be chosen. Thus, when accessing the "*Graph option*" from the toolbar, first a dialogue will appear which allows selection of the device from which the variables will be chosen, and that will be part of the graph.



Device's tree

Device selection

After selecting the device, click on *'Accept'* and a graphical selection screen and the discriminator to be applied will be displayed, depending on the device that has been selected.

Discriminator and type selection

Note only certain types of graphs can be filtered, usually the standard type, if the graph type chosen cannot be filtered the "*filter*" option will be disabled. If a default filter has been defined for the equipment, it may still be modified or another one chosen or it may be disabled. It is also possible that the equipment does not allow more than one type of graph, and that there are no filters defined, or they

are not applicable to this type of graph; in which case this screen will not appear and will pass directly to selection of variables for the device in question.

After selecting the figure type and filter, the variables selection screen will appear.

Variables selection general view

To select the variables, open the desired variable from the drop-down list and select the variables that will be displayed.

Variables selection detailed view

Once variable display selection has been made, the graph with the variables in question will appear.

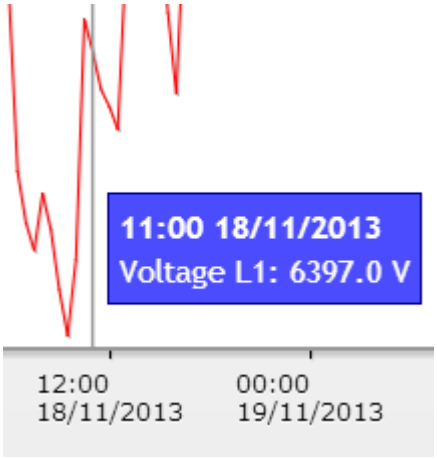
The system automatically chooses the representation period and the grouping of data, which can obviously be changed later. Later we will explain what the two concepts mean and how they can be changed. It should be noted that the grouping chosen is a week and the period is typically 30 minutes. If the graph we are accessing comes from graph control on a SCADA screen, both the grouping and the period are determined in the control and need not be predetermined by default. However, as always, both properties can be modified in the graph view later. Similarly certain types of representations are chosen by default (line, bars, etc.), as well as a few colors and a distribution of the variables in axes and areas depending on the variables represented. All these characteristics can be modified later at will. A description of what they mean and how they are modified will be explained later.

Graph of a standard variable without filtration

As can be seen a typical graph consists of a series of common characteristics:

- ***Title:*** Situated on the upper area, this is a text describing the graph being viewed. Typically, the names of devices forming part of the displayed variables are shown. They may contain several lines of text, so that they can be represented as subtitles.
- ***Representation areas:*** These are areas where data may be viewed. Typically, a graph consists of one area, as in the previous example, but there may be several, each under the next. Each area contains some common characteristics:
    - ***Key:*** Provides general information about the variables that are represented in the area. This information is often the color of the variable, the type of representation, the title of the graph, and in some cases, a value indicating some feature of the variable for the current representation (for example it is typical to see on energy variables the accumulated value of all the visible values).
    - ***Y-Axis:*** Provides information on the units of the variables that are represented in this axis and the range of values that are being displayed. At first the range is calculated so that they fit all the values of all the variables included in this axis. Typically, an area has a y-axis, although this may be modified by the user as will be explained later.
    - ***X-axis:*** Typically, this is the time axis and is located at the bottom of the representation area. Here the time interval being represented may be seen. Usually predefined time intervals are represented (day, month, etc.). But the user can choose the most suitable as can be seen later. Similarly, there are types of graphs where this axis does not represent time, in this case the units represented and the range of values contained will be indicated.
    - ***Drawing area:*** Contains the actual figure representing the variables of the area in question. There is a drawing area for each area of representation.

In addition, the graphic shows the tooltip function, which will display the values of the variables closest to the cursor from the X-axis. These values are updated instantly as the cursor is moved.



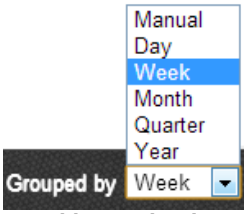
Tooltip mode

The graphs always have a toolbar at the bottom that allows a series of actions related to the data to be shown.

Toolbar of a typical graph

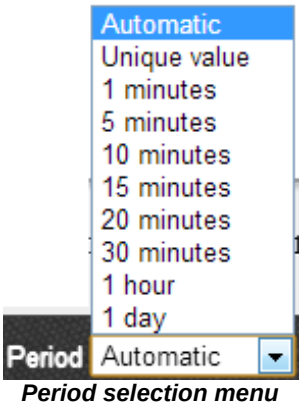
The typical options available in the toolbar are:

- ***Back:*** Displays the previous interval of data. Typically, the range of previous data is a function of data grouping and, if grouped by days, upon going to the previous interval the previous day's data is displayed. There are types of graphs where grouping does not make sense, because they are displaying values of a specific date (for example in QNA harmonics graphs), clicking on this option in this case displays the next date immediately following that contains data.
- ***Next:*** Displays the next interval of data. Typically, the interval of data following this is based on the data grouping and, if grouped by weeks, upon going to the following interval data from the following week is displayed. There are types of graphs where grouping does not make sense, because they are displaying values of a specific date (for example in QNA harmonics graphs), clicking on this option in this case displays the next date immediately following that contains data.
- ***Go to:*** Displays data within a user-defined time interval.
- ***Grouped by:*** Allows data grouping to be changed. Grouping is just the data interval desired to be displayed. Typically there are six predefined groupings: manual, day, week, month, quarter and year.



"Grouped by" Selection Menu

- ***Period:*** Enables desired date period to be specified. Each device can be configured to store data every so often, typically in periods of 10 or 15 minutes. Use this option view data in a different period, which must always be higher than that defined by the device. Note that this does not change the configuration of the device, which will continue using the period configured by the engine / editor, but will group the data, to a certain extent, to simulate the fact that the device was programd for that period. Note that there is an "*Automatic*" option, which directs the program to choose the period that best suits the selected grouping.

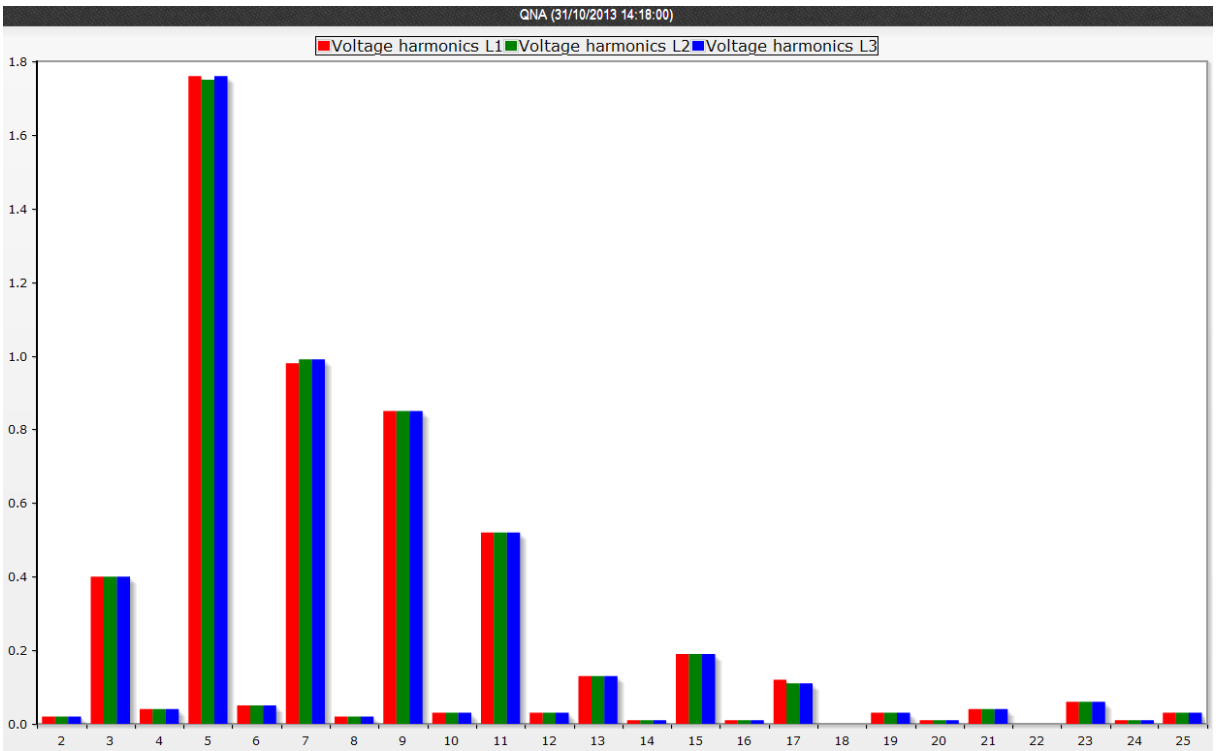


Period selection menu

1.3.6.1 Graph types

So far we have seen standard graph types, i.e. graphs comprising a number of areas, where each zone has an X-axis, which is a time interval and a Y-axis for variable values. However, there are certain types of graphs that have distinct characteristics.

A harmonics graph would be a special graph. This chart is provided by equipment that calculates harmonics variables, whether voltage or current. This type of graph may be found on QNA equipment, for example, among others, and can show harmonic distortion for voltage as well as current in each phase.



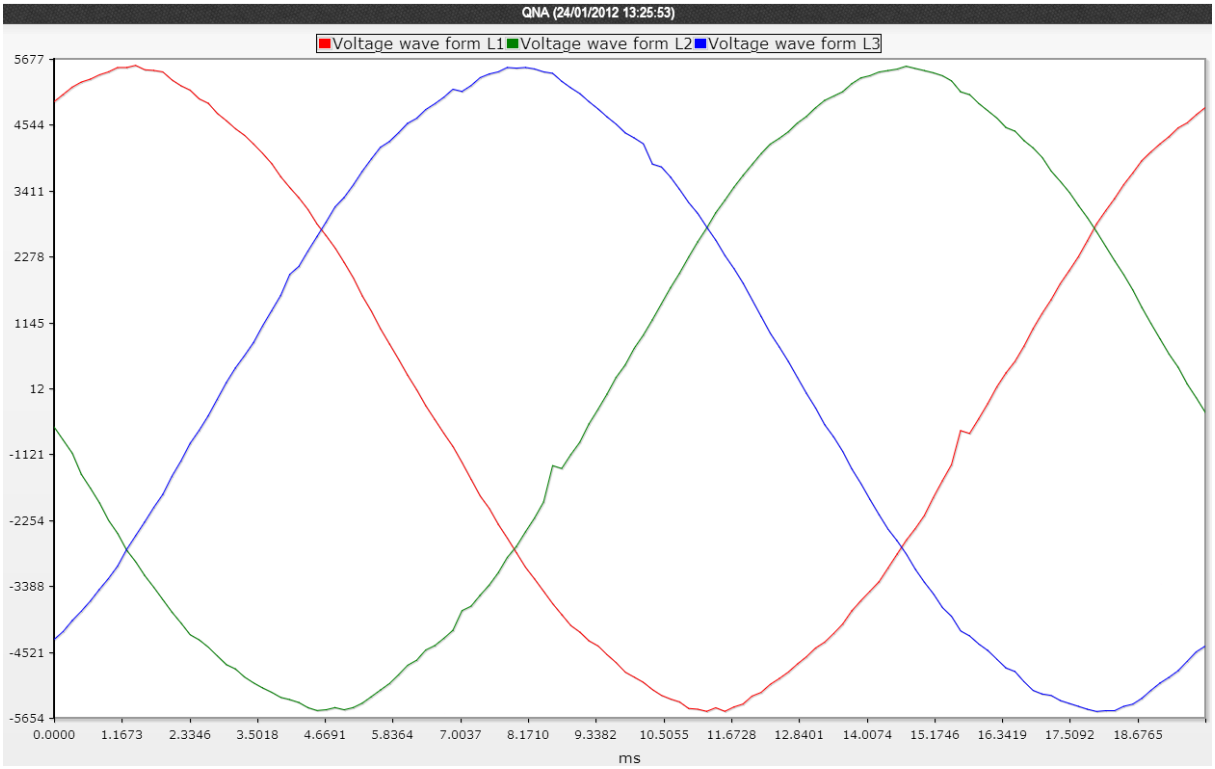
Harmonics graph

This type of graph has some special features:

- ***Subtitle:*** In the caption under the graph title, the date of the harmonic distortion being displayed is indicated.
- ***X-axis:*** The X- axis does not represent time, but rather the harmonic number. It therefore lacks units.
- ***Toolbar:*** The toolbar contains only 3 buttons to display other records, earlier records may be displayed, or later ones, or those closest to a date specified by the user ("*Go to*" option).

Another special feature graph is the waveform graph, generated by QNA equipment, which can provide a screenshot of the voltage waveform as well as the current in each one of the phases.

The characteristics of this graph are very similar to the harmonics graph. The only differences are that the X-axis units are milliseconds and that the representation is in lines by default. Only waveform variables may be added to this type of graph.



QNA waveform graph

1.3.7 Making tables

Another important client tool is the ability to make variable value tables for a piece of equipment. Access this view using the "*Table*" button in the toolbar. Also, tables may be created from a predefined SCADA screen, where a control table has been added.

Typically, to make a table it is necessary to choose what variables from which devices will be part of it. The selection of these variables is done in the same manner as for generating a graph. Selection produces a table like this:

18/11/2013 - 24/11/2013			
Date/time	Voltage L1 (V)	Voltage L2 (V)	Voltage L3 (V)
18/11/2013 00:00:00	6592,8	6592,9	6592,5
18/11/2013 00:30:00	6630,1	6630,7	6630,2
18/11/2013 01:00:00	6592,9	6593,9	6593,1
18/11/2013 01:30:00	6579,1	6578,8	6578,6
18/11/2013 02:00:00	6555,1	6555,3	6554,7
18/11/2013 02:30:00	6547,2	6546,2	6546,2
18/11/2013 03:00:00	6550,3	6550,6	6550,7
18/11/2013 03:30:00	6574,6	6574,9	6574,3
18/11/2013 04:00:00	6557	6556,8	6556,3
18/11/2013 04:30:00	6537,5	6537	6536,5
18/11/2013 05:00:00	6502,1	6502,1	6502,1
18/11/2013 05:30:00	6459,3	6459,7	6459,1
18/11/2013 06:00:00	6409,6	6409,5	6409,5
18/11/2013 06:30:00	6369,2	6369,5	6368,6
18/11/2013 07:00:00	6357,3	6357,1	6356,4
18/11/2013 07:30:00	6350,7	6351	6350,5
18/11/2013 08:00:00	6364,1	6364,5	6363,8
18/11/2013 08:30:00	6355,4	6356	6355,8
18/11/2013 09:00:00	6341,5	6342,4	6341,8
18/11/2013 09:30:00	6330,9	6331,3	6331
18/11/2013 10:00:00	6348,8	6348	6347,5
18/11/2013 10:30:00	6404,7	6404,6	6403,9
18/11/2013 11:00:00	6397	6396,7	6396,7
18/11/2013 11:30:00	6388,2	6387,5	6387,2
18/11/2013 12:00:00	6384,2	6383,6	6383,3
18/11/2013 12:30:00	6378,9	6378,5	6378

Value table

Note that the typical value table consists of three parts:

- ***Title:*** This usually indicates what data period is displayed, although in special tables it may contain other information.
- ***Body:*** This contains a series of columns with the values each variable has in each register. Each column is a variable and contains a header with the same title.
- ***Toolbar:*** As in the graph, the grouping and the displayed data period can be configured.

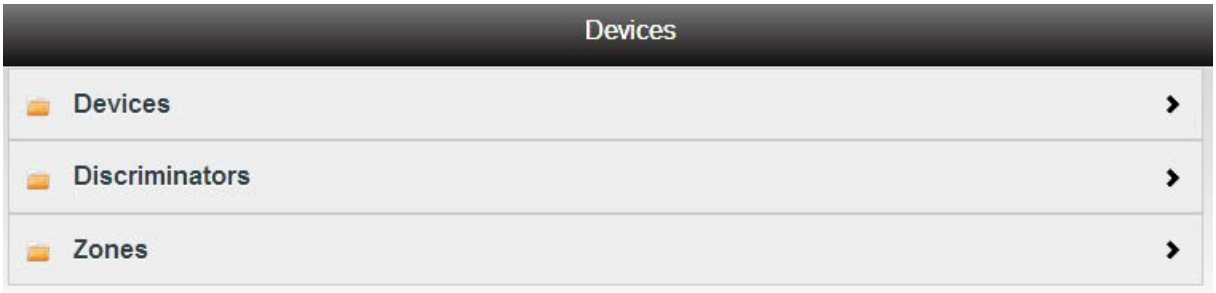
There is a direct equivalence between the tables and graphs, in other words, the same type of graph and table show the same values but in different formats and, obviously, with different configuration capacities.

This feature is used by the PowerStudio client to deduce what graph or table to create when on a graph or table display. That is, if a chart is displayed and client table button is clicked, PowerStudio will deduce that a table of the variables represented in the graph is desired, and will immediately display it. Likewise, if a table is displayed and the graph button is clicked, PowerStudio client will deduce that a graph of the variables shown on the table is desired.

A common feature in all tables is that they can be sorted by columns by clicking on them. By default, tables usually appear sorted by date, usually the first column, but they can be ordered by other variables. Clicking on the title of a column will place it in ascending order, clicking again on the same place set it in descending order, and a third click will bring it back to its original format.

1.3.8 Displaying a device

The client application can display all devices in real time. Thus, each device provides one or more overviews that allow its status and values to be displayed in real time. Display this view directly from the "*Devices*" button on the toolbar.

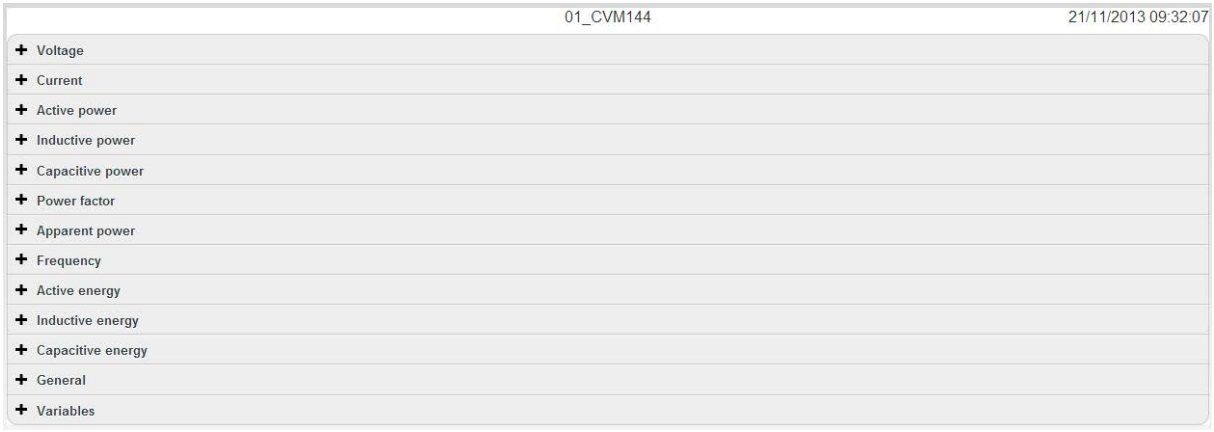


User defined device tree organization

The route will be updated as you open the user-defined folders, which are found at the top of the next capture. Select the *'Devices'* folder and open the *'CVM-144'* folder to display the following view with its units:

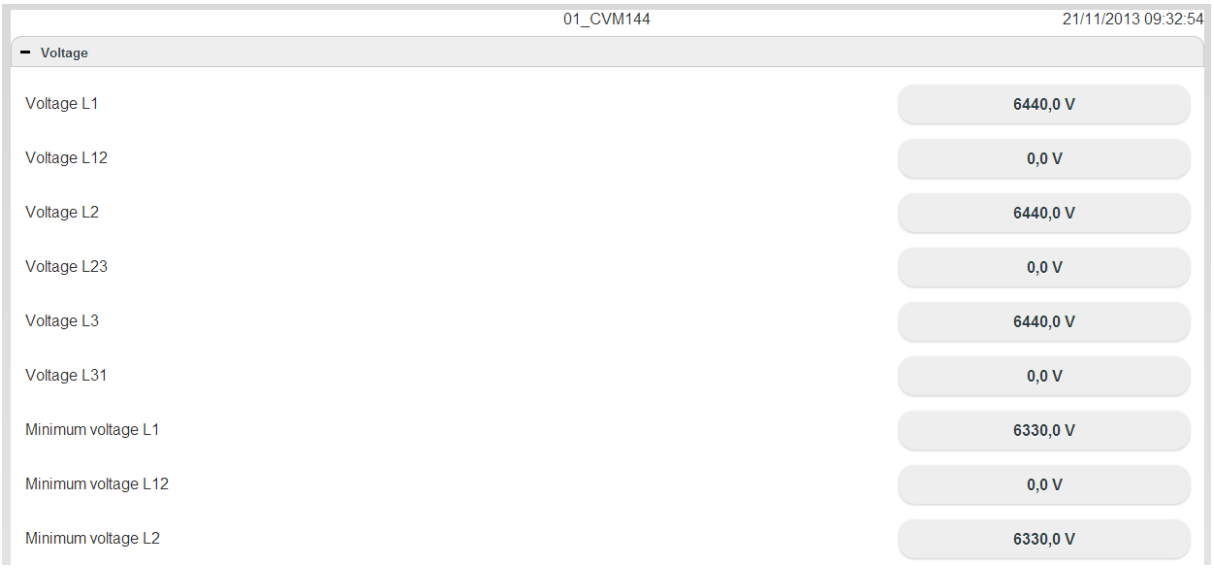
Group view

You can also access the display screen of a particular device from a SCADA screen where a control device has been added. A common element on all the display screens is that there are numerical values for the variables which refresh in real time. Another common element is that on most displays there is an upper bar specifying the device status, and the name and date on which the values displayed were read.



Device display screen

The values of the different variables are organised on tabs for easy location, as shown on the previous screen. If you open all of the groups of variables from the drop-down menu, the values of the device can be viewed in real time:



Detailed device display screen

1.3.9 Displaying logged events[9]

Another important client tool is the ability to create tables showing information about past events. Access this view using directly the "*Events*" button on the toolbar. A table of events from a SCADA screen can be created wherein the event display control can be added

21/11/2013						
Date and time	Name	Annotation	Acknowledgement annotation	Deactivation annotation	Recognized in	Deactivated in
21/11/2013 08:35:22	High voltage	CVM-96 voltage so high!		Voltage decreasing to usual values		3s
21/11/2013 08:35:22	Activation 4_Disp_31					1s
21/11/2013 08:35:24	Activation 4_Disp_31					1s
21/11/2013 08:35:24	Activation 2_Disp_31					1s
21/11/2013 08:35:24	Activation 1_Disp_31					1s
21/11/2013 08:35:26	Activation 4_Disp_31					1s
21/11/2013 08:35:27	Activation 2_Disp_31					1s
21/11/2013 08:35:28	Activation 4_Disp_31					1s
21/11/2013 08:35:28	Activation 1_Disp_31					1s
21/11/2013 08:35:30	Activation 4_Disp_31					1s
21/11/2013 08:35:30	Activation 3_Disp_31					1s
21/11/2013 08:35:30	Activation 2_Disp_31					1s
21/11/2013 08:35:32	Activation 4_Disp_31					1s
21/11/2013 08:35:32	Activation 1_Disp_31					1s
21/11/2013 08:35:33	Activation 2_Disp_31					1s
21/11/2013 08:35:34	Activation 4_Disp_31					1s
21/11/2013 08:35:36	Activation 4_Disp_31					1s
21/11/2013 08:35:36	Activation 2_Disp_31					1s
21/11/2013 08:35:36	Activation 1_Disp_31					1s
21/11/2013 08:35:38	Activation 4_Disp_31					1s
21/11/2013 08:35:39	Activation 2_Disp_31					2s
21/11/2013 08:35:41	Activation 1_Disp_31					1s
21/11/2013 08:35:42	Activation 4_Disp_31					1s
21/11/2013 08:35:42	Activation 2_Disp_31					1s
21/11/2013 08:35:44	Activation 4_Disp_31					1s
21/11/2013 08:35:44	Activation 1_Disp_31					1s
21/11/2013 08:35:45	Activation 2_Disp_31					1s
21/11/2013 08:35:46	Activation 4_Disp_31					1s
21/11/2013 08:35:47	High voltage	CVM-96 voltage so high!				
21/11/2013 08:35:48	Activation 4_Disp_31					1s

Logged events table

This table has two different viewing modes, the normal mode and the total mode. The normal mode (above) table consists of five columns.

- ***Date and time:*** Indicates the date and time at which the incident occurred.
- ***Name:*** Name of event that occurred.
- ***Annotation:*** Description of the event when it is activated, which can include data related to the event or to the execution environment when the event is activated.
- ***Acknowledgement annotation***: Description of the event when it is acknowledged.
- ***Deactivation annotation***: Description of the event when it is deactivated.
- ***Recognized in:*** Time taken for the event to be acknowledged, whether or not it is finally acknowledged. Floating the cursor over a cell will bring up a tooltip with the date on which the event was recognized.
- ***Deactivated on:*** Time the event took to end, if it actually ended. Floating the cursor over a cell will bring up a tooltip with the date on which the event ended, if the event existed.

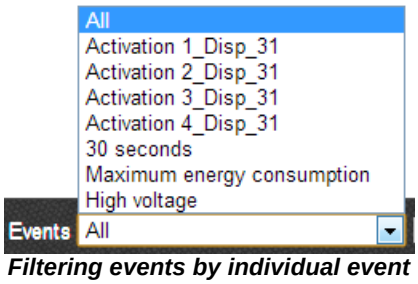
As a standard table, the active events table shows a time interval. These intervals may be navigated or modified using the toolbar and the first four buttons on the left, as was discussed in the section on graphs. However, the toolbar provides some extra options that permit a certain degree of configuration for this type of table.

Logged events table toolbar

[9] Only in SCADA and Deluxe versions

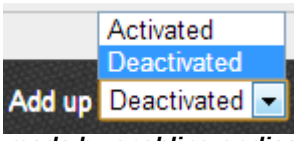
There are a couple of options that permit desired events to be filtered according to the group they belong to or according to a specific event.

Filtering events by group



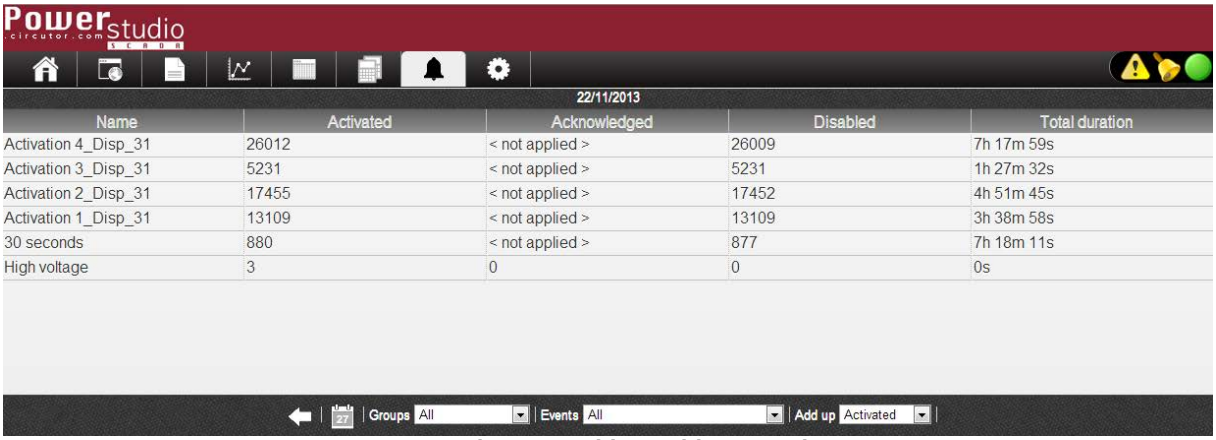
Filtering events by individual event

The latter option permits changes to the display mode. Thus, the total mode may be enabled or disabled.



Change the display mode by enabling or disabling the total view

Activating the total view produces the following list:

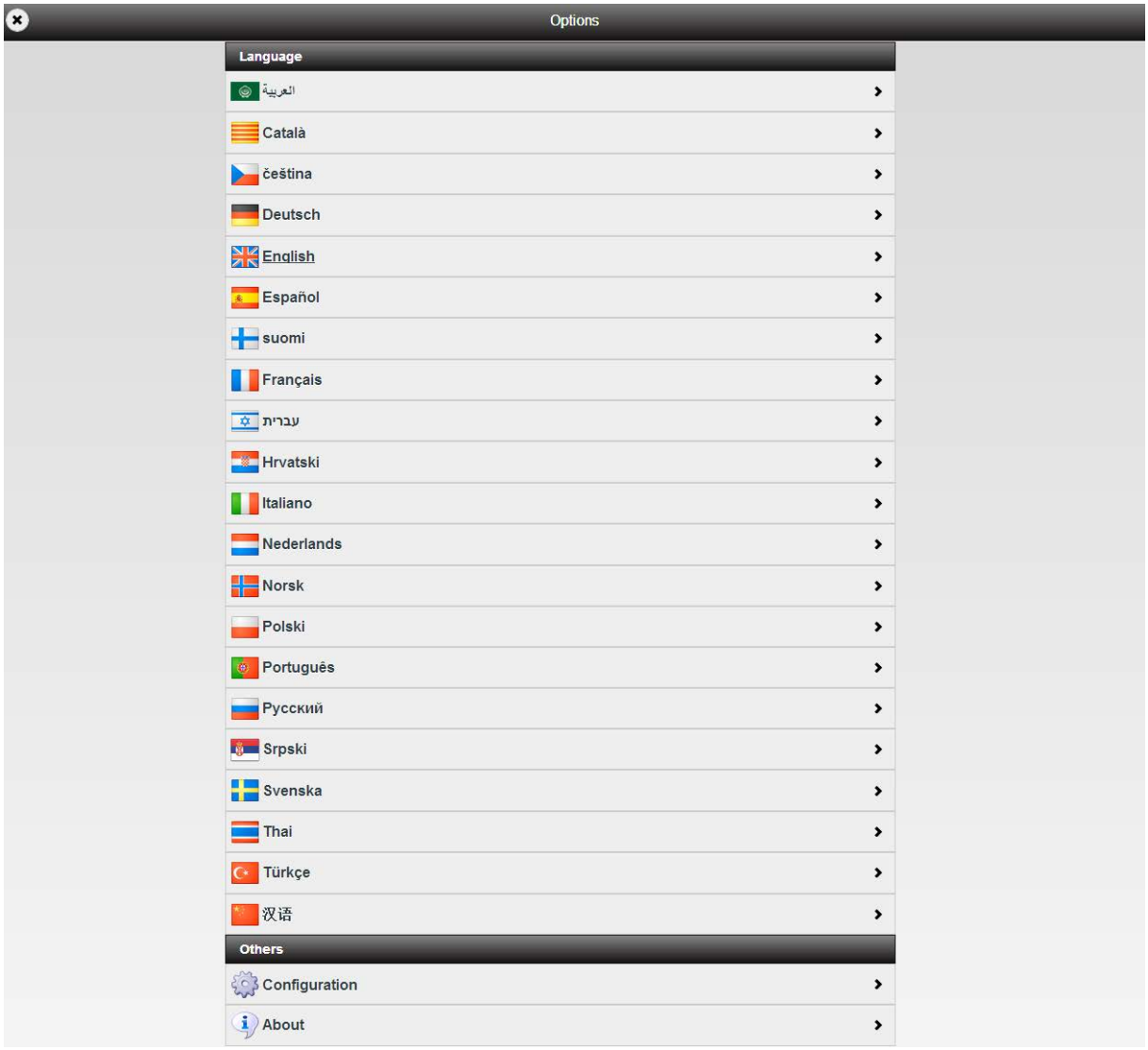


Logged events table, "Add up" mode

In this mode the table consists of five columns, one less than in the previous, and as many rows as events defined in the environment. The first column indicates the event name, the second the number of times it has been enabled in the period to which the data refers (indicated in the title), the third column indicates how many times this event has been acknowledged (or <not applicable> if the incident is not reported), the fourth column indicates how many times it has been disabled, and the fifth the total time that the event has been active.

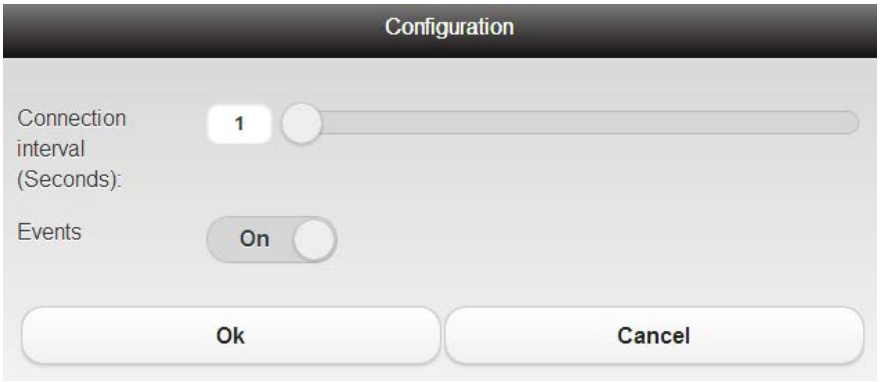
1.3.10 Options

Click on the "*Options*" button in the toolbar to open this view. This view will show the different available languages and the *"Configuration"*.



Options

If a change of language is selected, the application will be restarted and the user will be redirected to the Dashboard. On the other hand, the following view can be displayed when accessing 'Configuration':

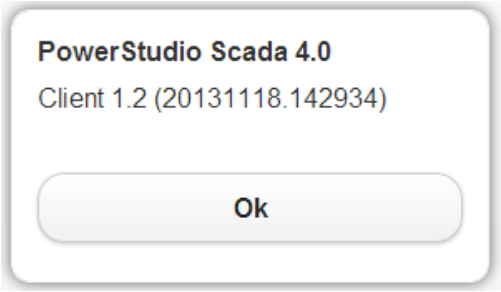


Configuration

Description of the different sections:

- **Connection interval**: Allows the user to define the number of seconds after which each data request is submitted. This utility is displayed in all clients, especially on Scada screens and on device displays.
- **Events:** Allows you to activate or deactivate events.

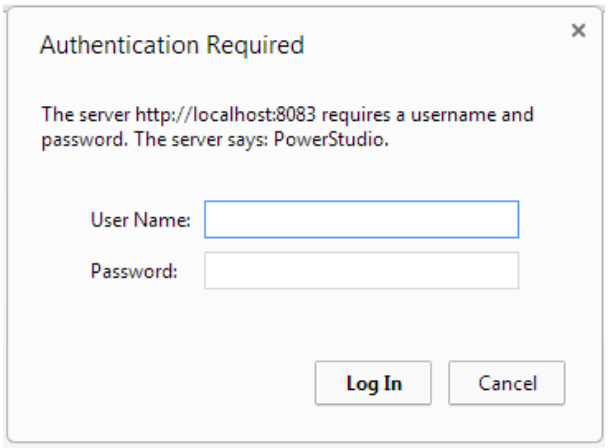
Finally, the “About” option activates a pop-up with the client version:



Client’s version

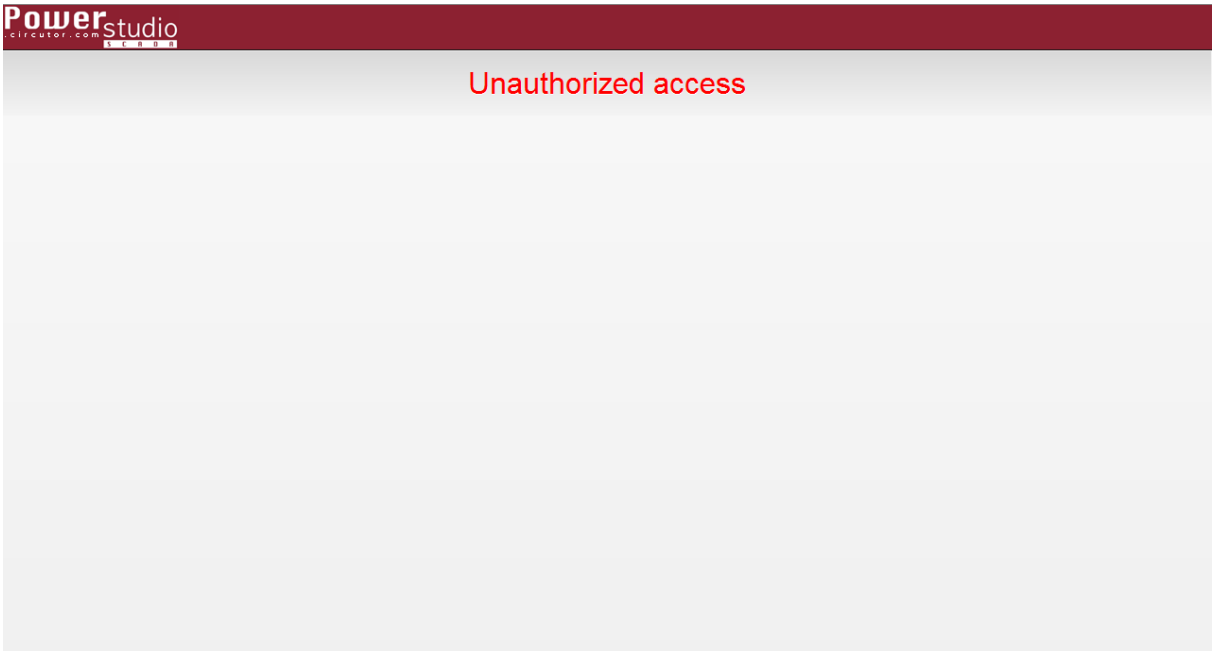
1.3.11 Authentication

If user authentication is enabled from the editor, the client may request a user name and password to access the various resources available. This will be done through a screen like this:



User authentication window

The user must correctly identify himself to access the resource. If the user and password are unknown try a connection as an anonymous user, which provides access to certain resources provided it has been properly configured from the editor. If the user is not identified correctly (three attempts are allowed) the client will not be allowed access to the resource.



Access denied

It is possible that once authenticated, the client will require identification again when trying to enter an area without having viewing privileges.

2.- MAINTENANCE AND TECHNICAL SERVICE

In the case of any query in relation to unit operation or malfunction, please contact the **CIRCUTOR, SA** Technical Support Service.

Technical Assistance Service

Vial Sant Jordi, s/n 08232 - Viladecavalls (Barcelona)
Tel.: 902 449 459 (Spain) / +34 937 452 900 (outside of Spain)
email: sat@circutor.es

3.- GUARANTEE

CIRCUTOR guarantees its products against any manufacturing defect for two years after the delivery of the units.

CIRCUTOR will repair or replace any defective factory product returned during the guarantee period.

- No returns will be accepted and no unit will be repaired or replaced if it is not accompanied by a report indicating the defect detected or the reason for the return.
- The guarantee will be void if the units has been improperly used or the storage, installation and maintenance instructions listed in this manual have not been followed. "Improper usage" is defined as any operating or storage condition contrary to the national electrical code or that surpasses the limits indicated in the technical and environmental features of this manual.
- **CIRCUTOR** accepts no liability due to the possible damage to the unit or other parts of the installation, nor will it cover any possible sanctions derived from a possible failure, improper installation or "improper usage" of the unit. Consequently, this guarantee does not apply to failures occurring in the following cases:
  - Overvoltages and/or electrical disturbances in the supply;
  - Water, if the product does not have the appropriate IP classification;
  - Poor ventilation and/or excessive temperatures;
  - Improper installation and/or lack of maintenance;
  - Buyer repairs or modifications without the manufacturer's authorisation.

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